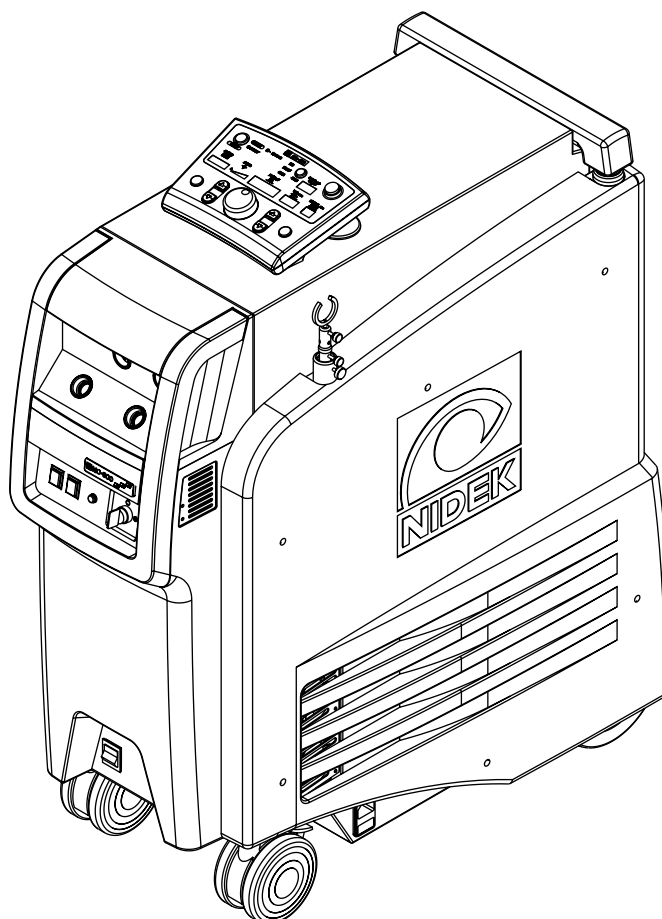


NIDEK

MULTI COLOR LASER PHOTOCOAGULATOR

Model MC-300

SERVICE MANUAL





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§1 INTRODUCTION

- This service manual is for the NIDEK MULTI COLOR LASER PHOTOCOAGULATOR, MC-300.
- For correct service, thorough understanding of the contents in this manual is required prior to the service.
- Refer to the operator's manual and parts list for the MC-300.
- Specifications are subject to change without notice for improvement. Refer to the Technical Bulletin (T. B.) for important changes.
- In case the system cannot be repaired according to the procedures described in this manual, please report the serial number of the system and details of the symptom or symptoms.

§2 SAFETY PRECAUTIONS

<General precautions>

- Servicing should be performed by NIDEK service persons or other qualified personnel.
- Perform all servicing according to the procedures described in this manual. Failure to do so may cause unexpected accident or malfunction.
- When performing maintenance work, turn off the power switch and disconnect the power cord from the wall outlet unless the power needs to be on.

<Maintenance precautions>

- Take antistatic precautions when touching the electric pole of the laser head.
- If case of system malfunction, check the symptom and turn the power switch off.
- Never drop parts or screws inside the system, nor bump it against surrounding objects.
- Prepare storage cases so as not to lose the removed parts and screws.
- Tighten or loosen screws with proper tools.
- After loosening the screws fastened by a threadlocking adhesive, be sure to reapply the threadlocking adhesive to the screws when retightening them.
- After replacing parts, make sure that they are fastened securely before turning on the power.
- Should you observe strange odors or smoke being issued from the system, immediately turn off the power switch, disconnect the power cord from the outlet, and investigate the cause. If the system is powered in abnormal conditions, fire, electric shock, or total loss of the system may result.
- The  labeled area indicates high voltage. Take proper precautions against electric shock.
- See Wiring Diagram and Connecting Cable for checking cable breaks as described in "TROUBLESHOOTING". In addition, check cables for the following:
 - (1) Connectors are connected and crimped properly.
 - (2) No contact failure occurs after re-connection of connectors.
 - (3) Cables are soldered properly.

Do not yank the cables with excessive force. Doing so could cause cable breakage.

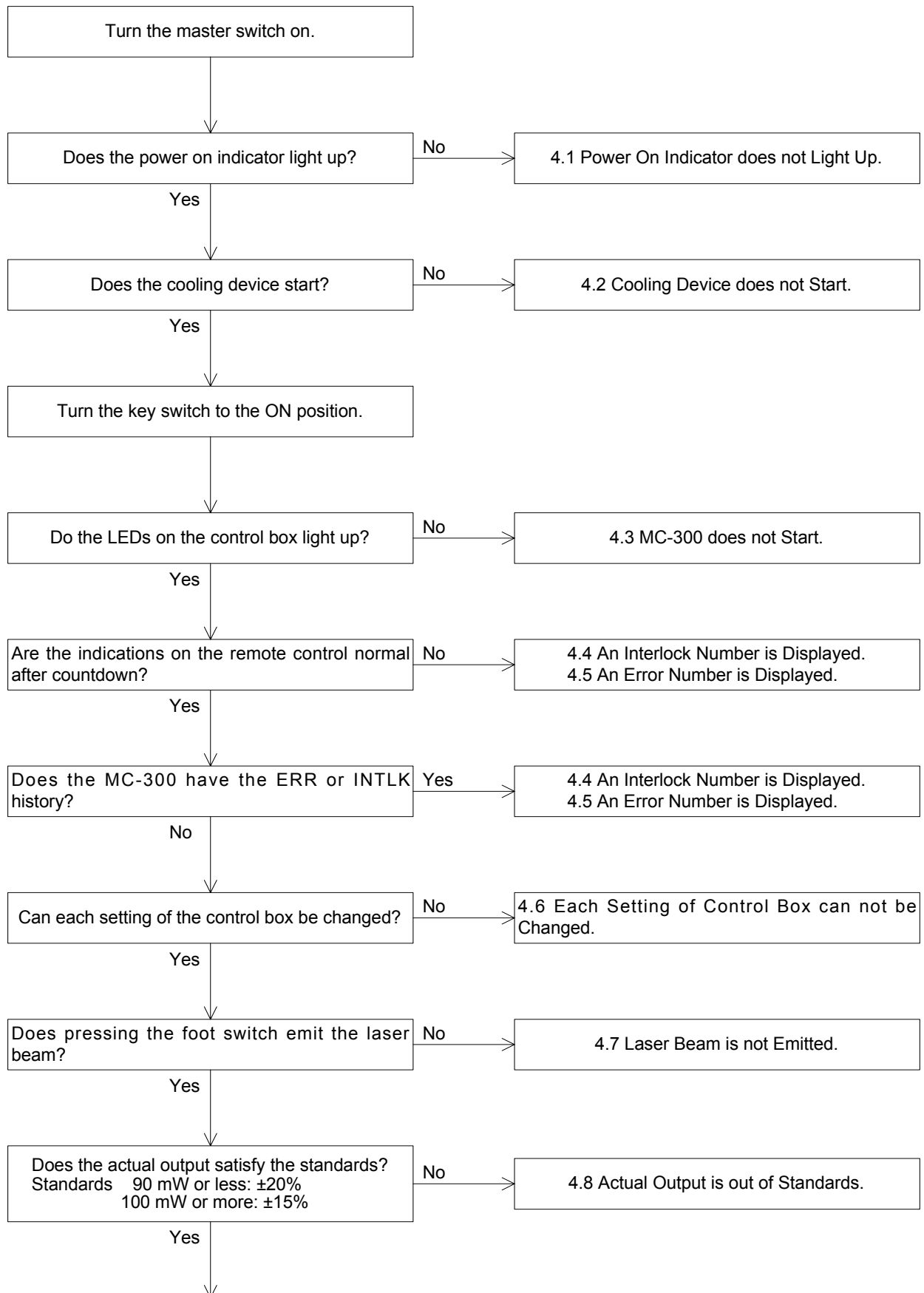
Never perform servicing with wet hands. Doing so could cause electric shock or malfunction.

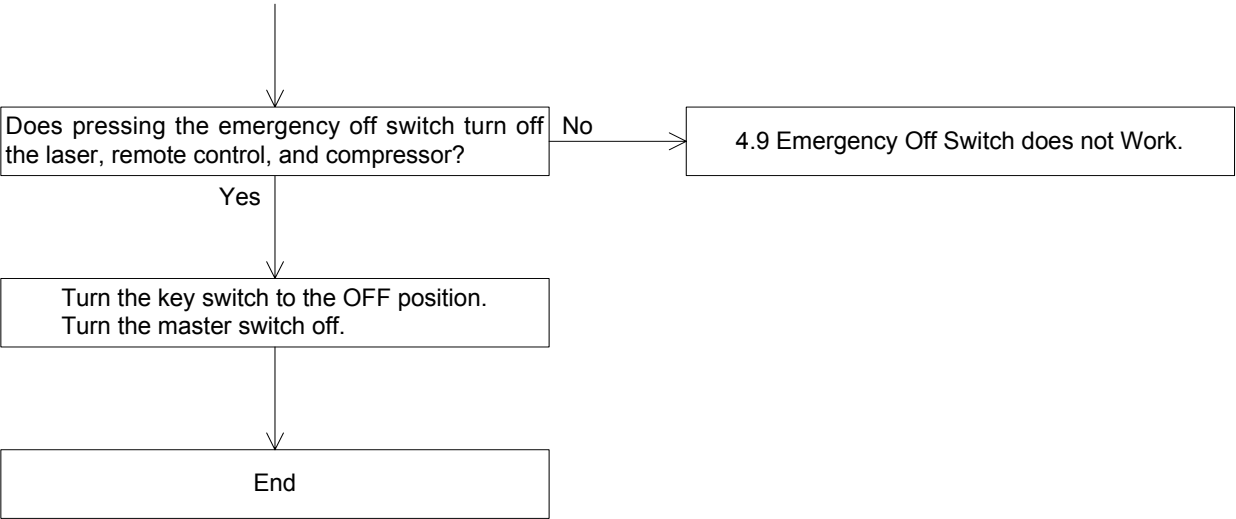
- Never emit the laser beam onto a reflective surface such as metal or other.
- Be sure to wear the safety goggles specified for the MC-300 during laser emission.
- Never emit laser beam (direct beam) toward a human body or object.

<Adjustment precautions>

- After turning the main switch off, let the MC-300 sit for 5 minutes or more before turning it on again.
- When the MC-300 is moved, let the system sit for 30 minutes or more before turning the main switch on.
- Adjust the MC-300 on a vibration-free, level, and stable surface.
A slanted floor or place subject to vibration will obstruct accurate adjustment.
- Do not use adjustment jigs for purposes other than those intended.

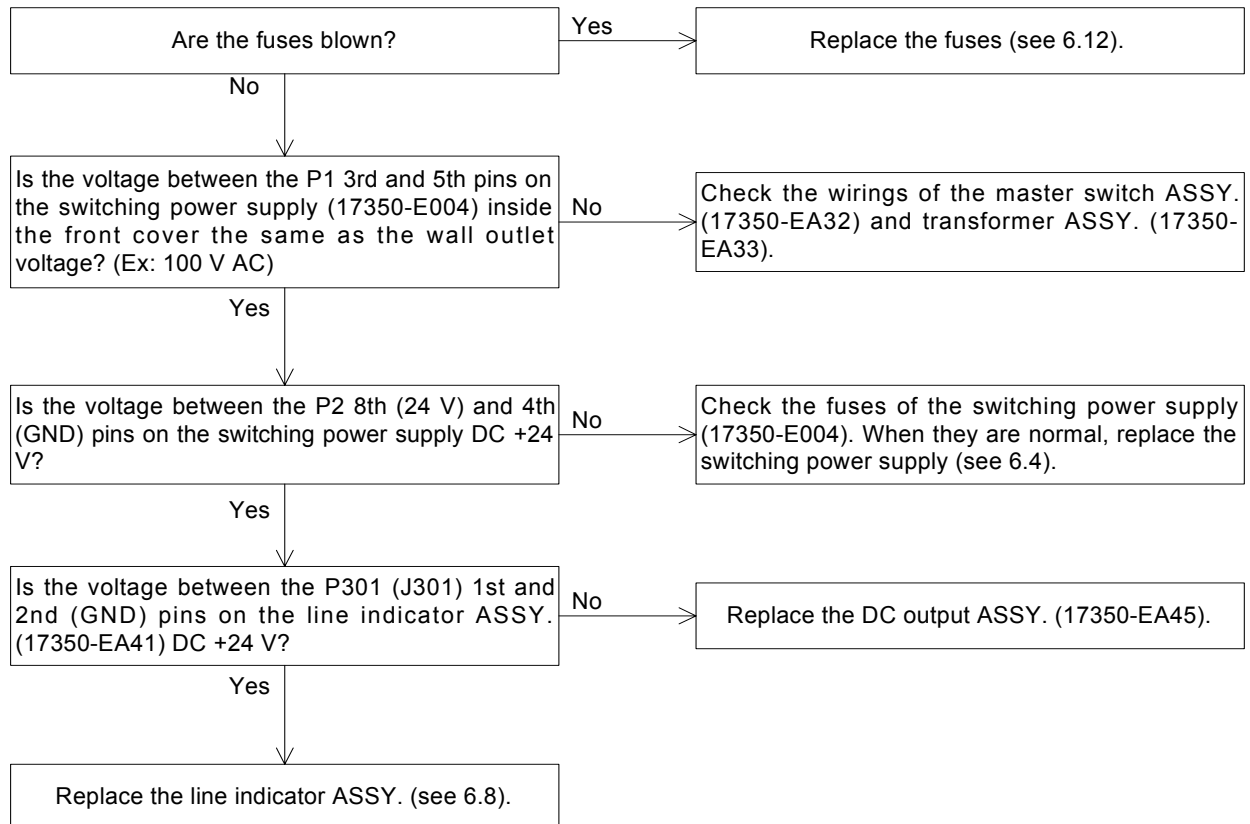
§3 TROUBLESHOOTING



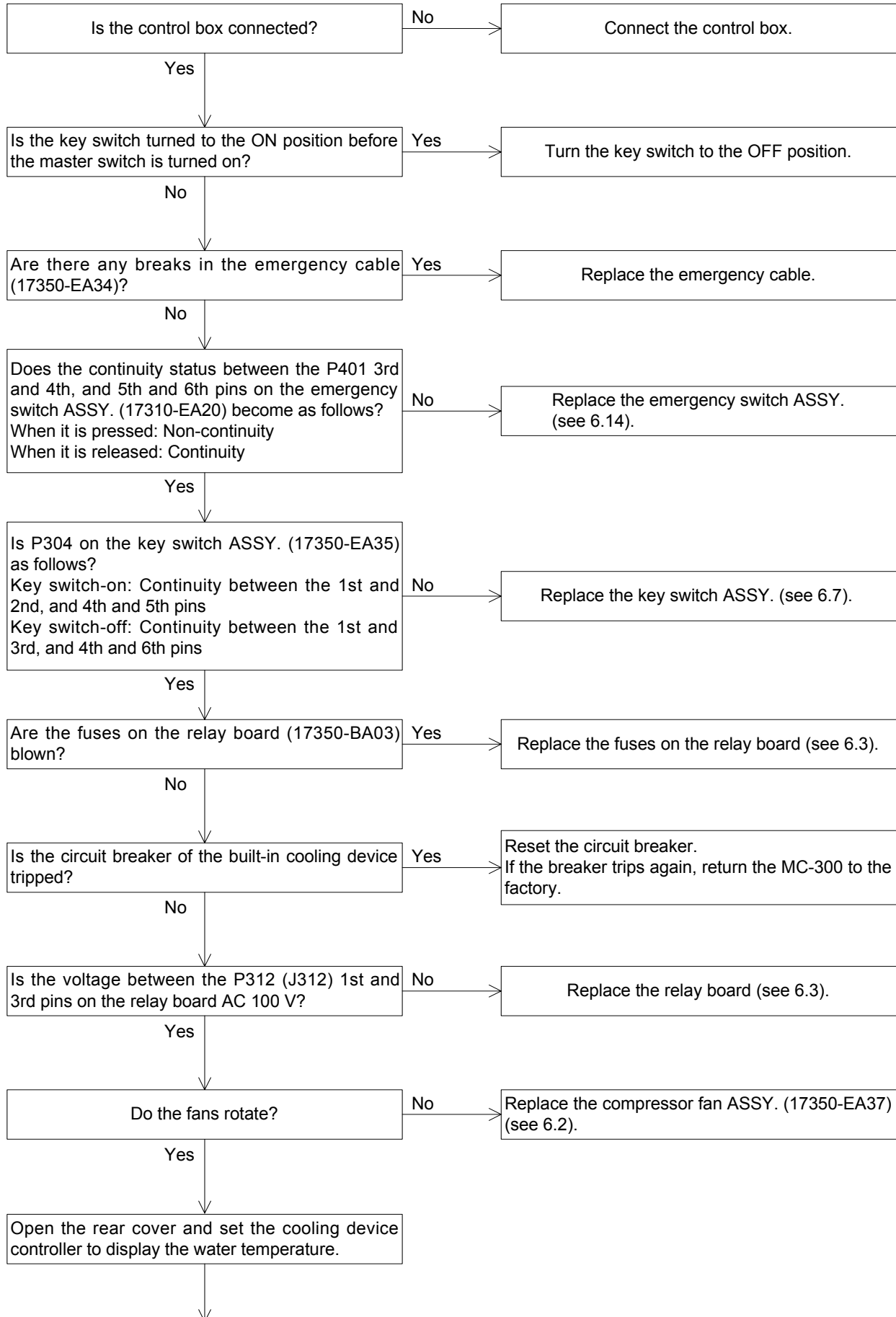


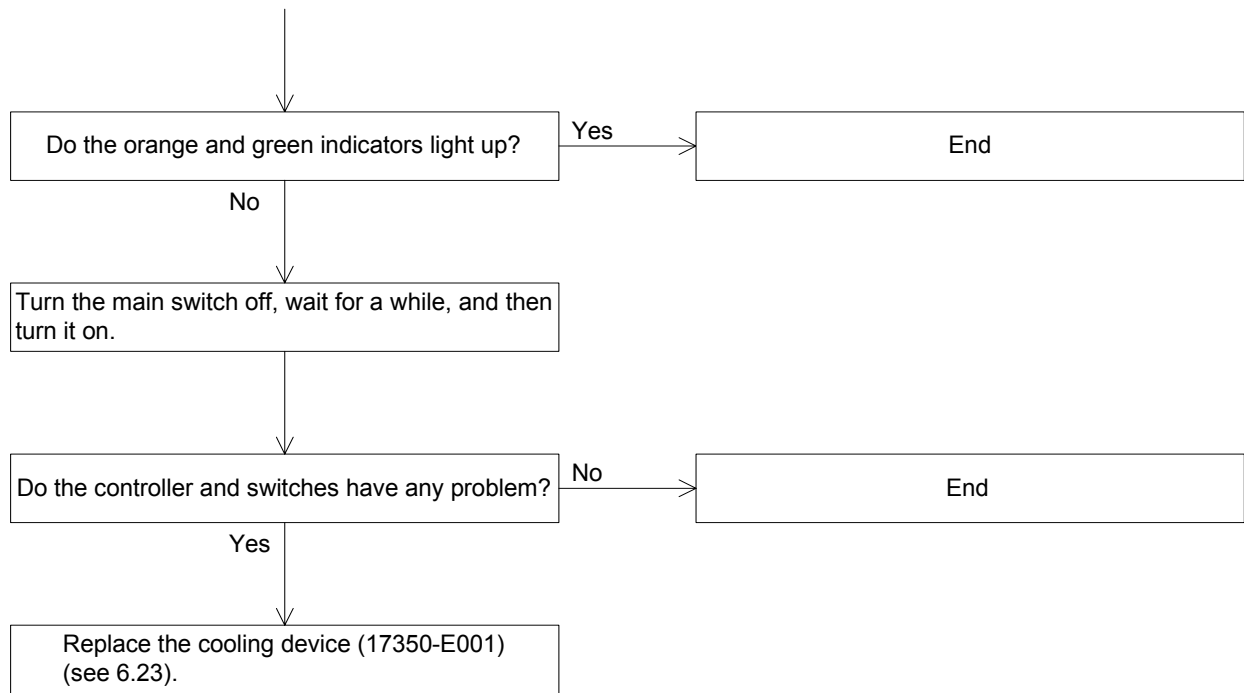
§4 SUBTROUBLESHOOTING

4.1 Power On Indicator does not Light Up.

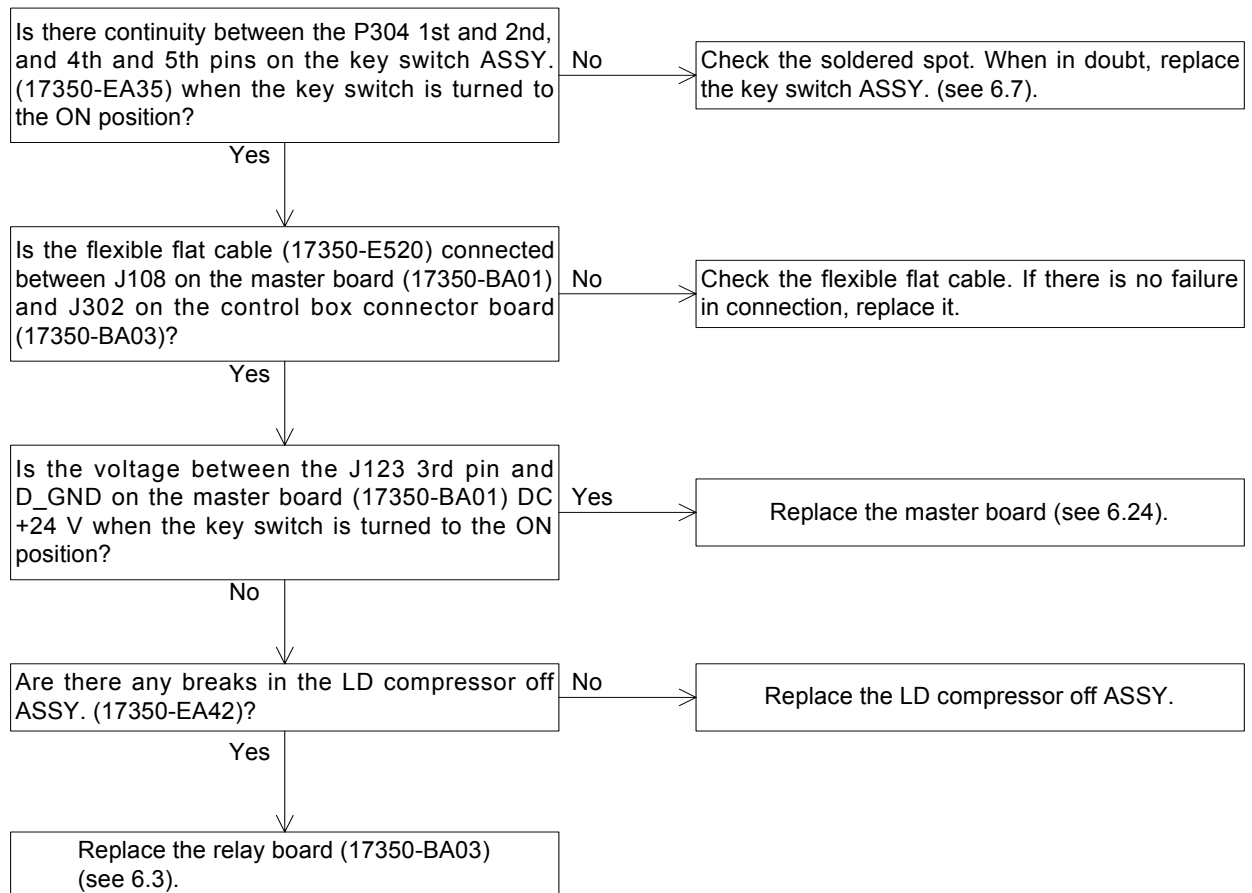


4.2 Cooling Device does not Start.

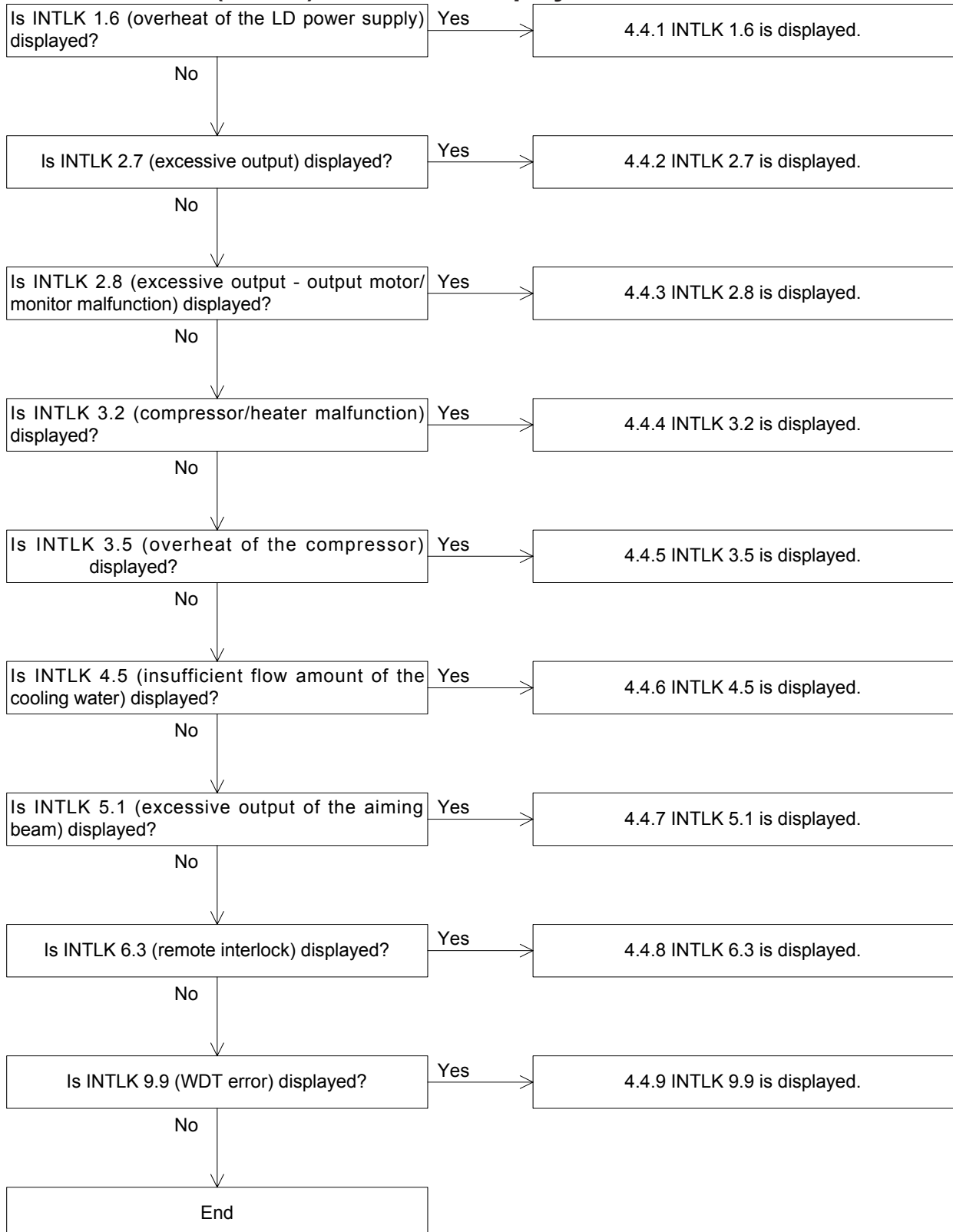




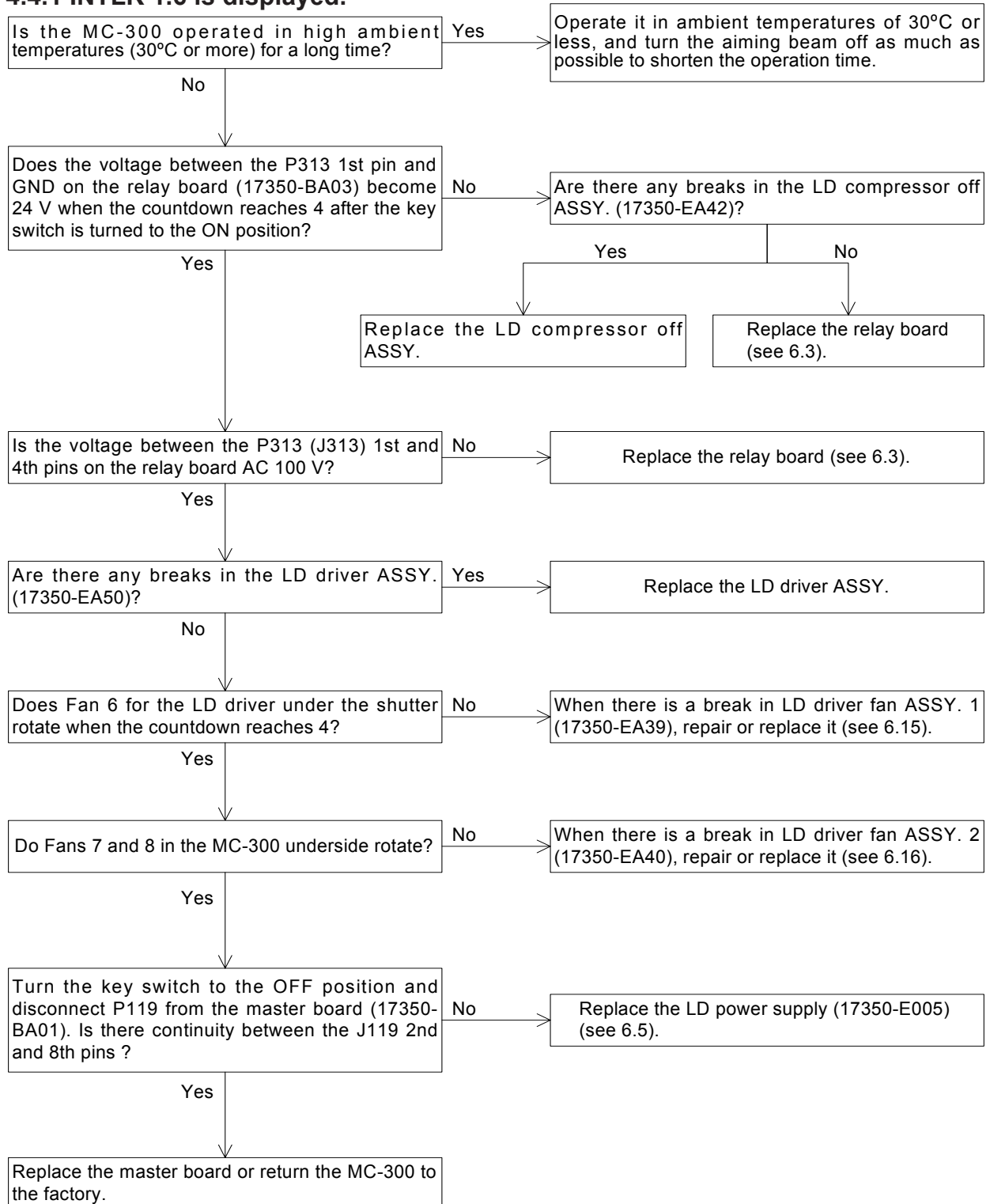
4.3 MC-300 does not Start.



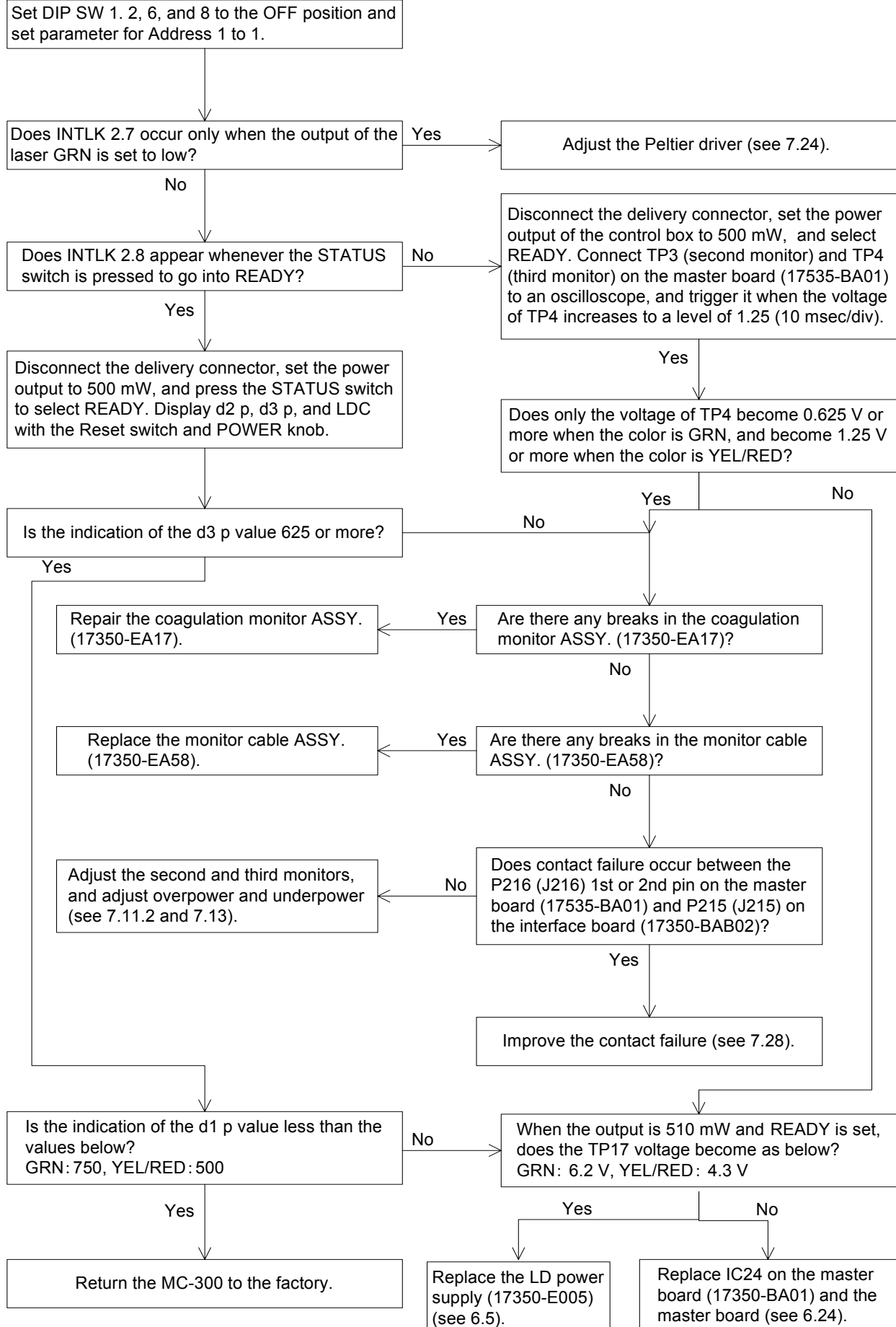
4.4 An Interlock (INTLK) Number is Displayed.



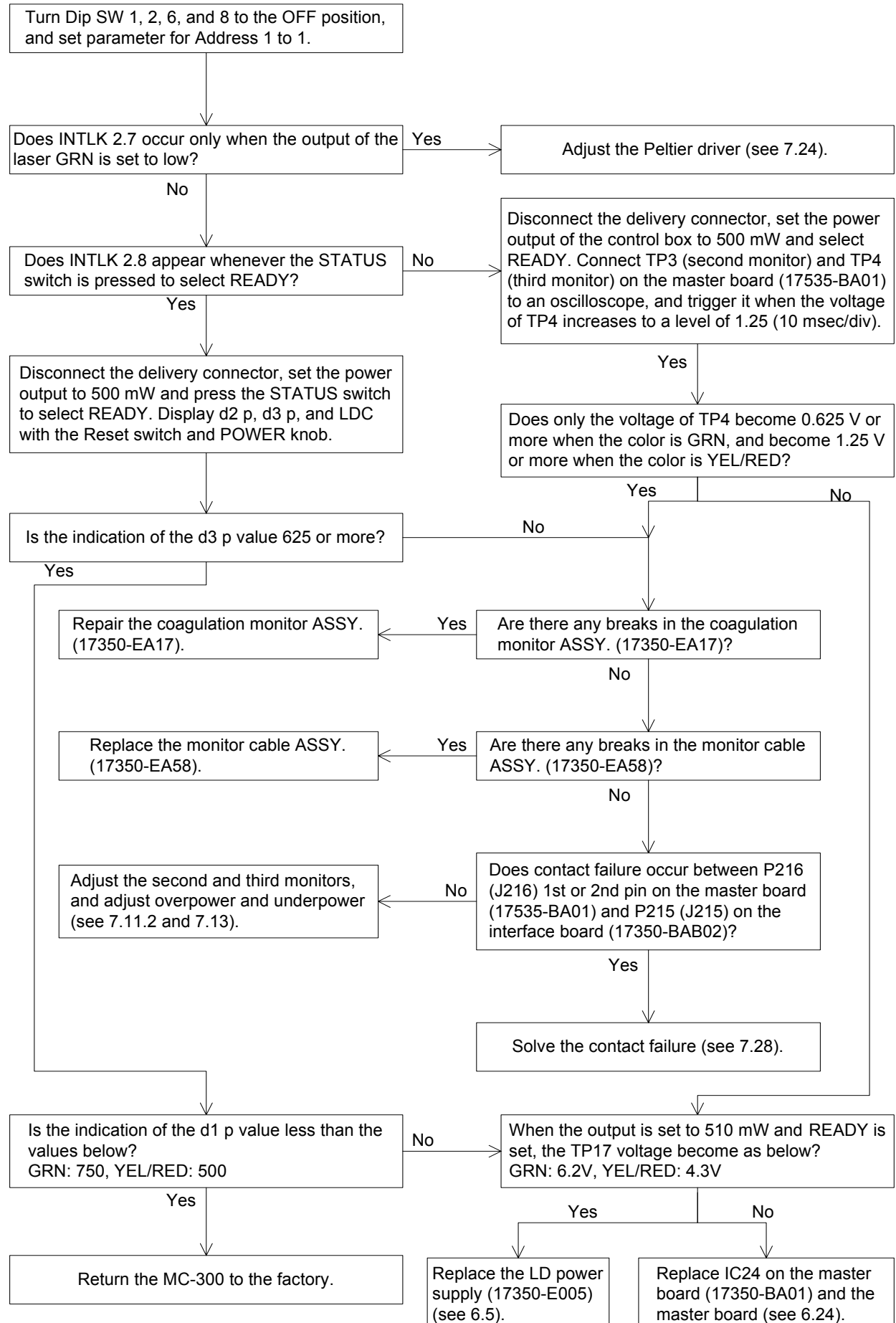
4.4.1 INTLK 1.6 is displayed.

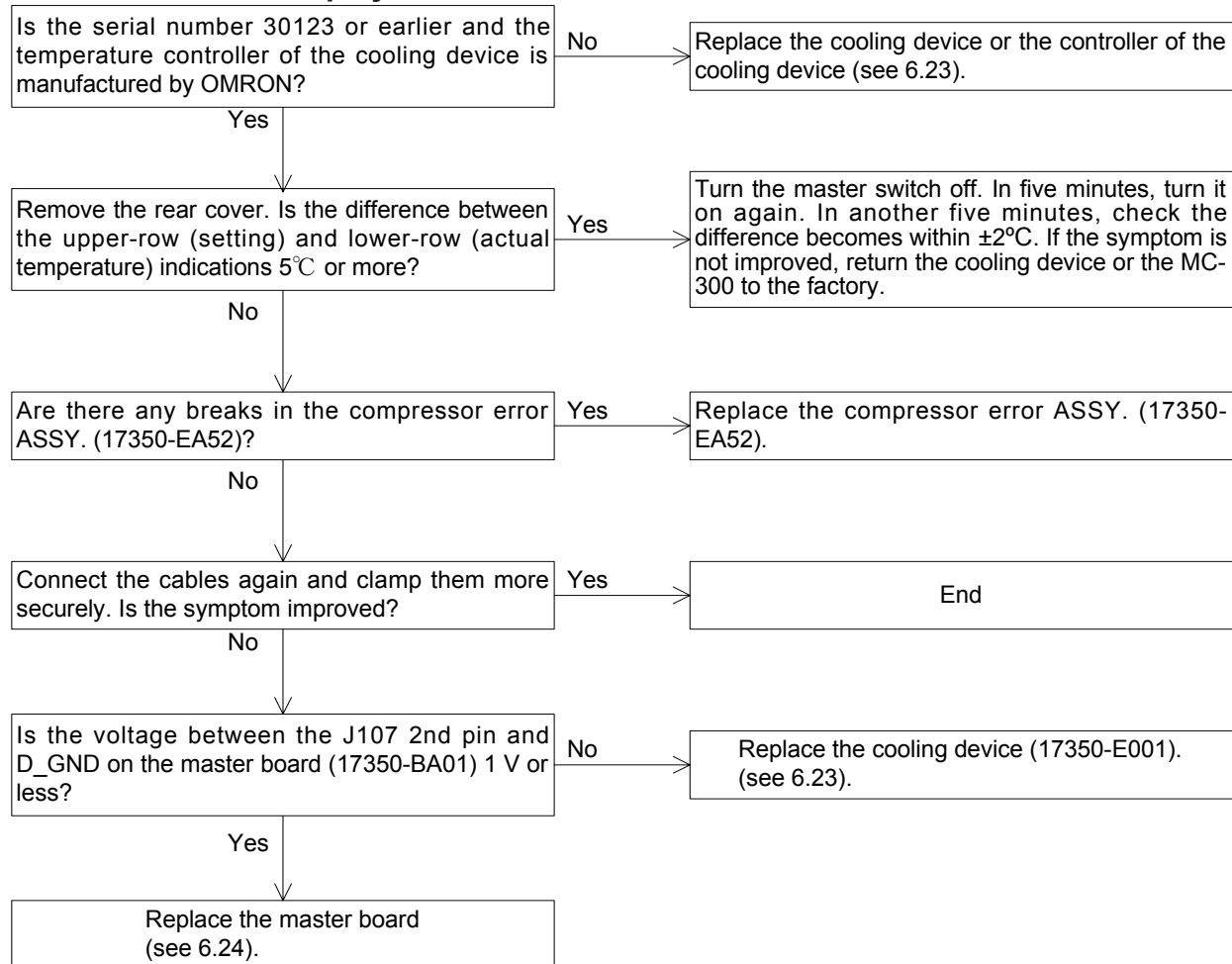


4.4.2 INTLK 2.7 is displayed.

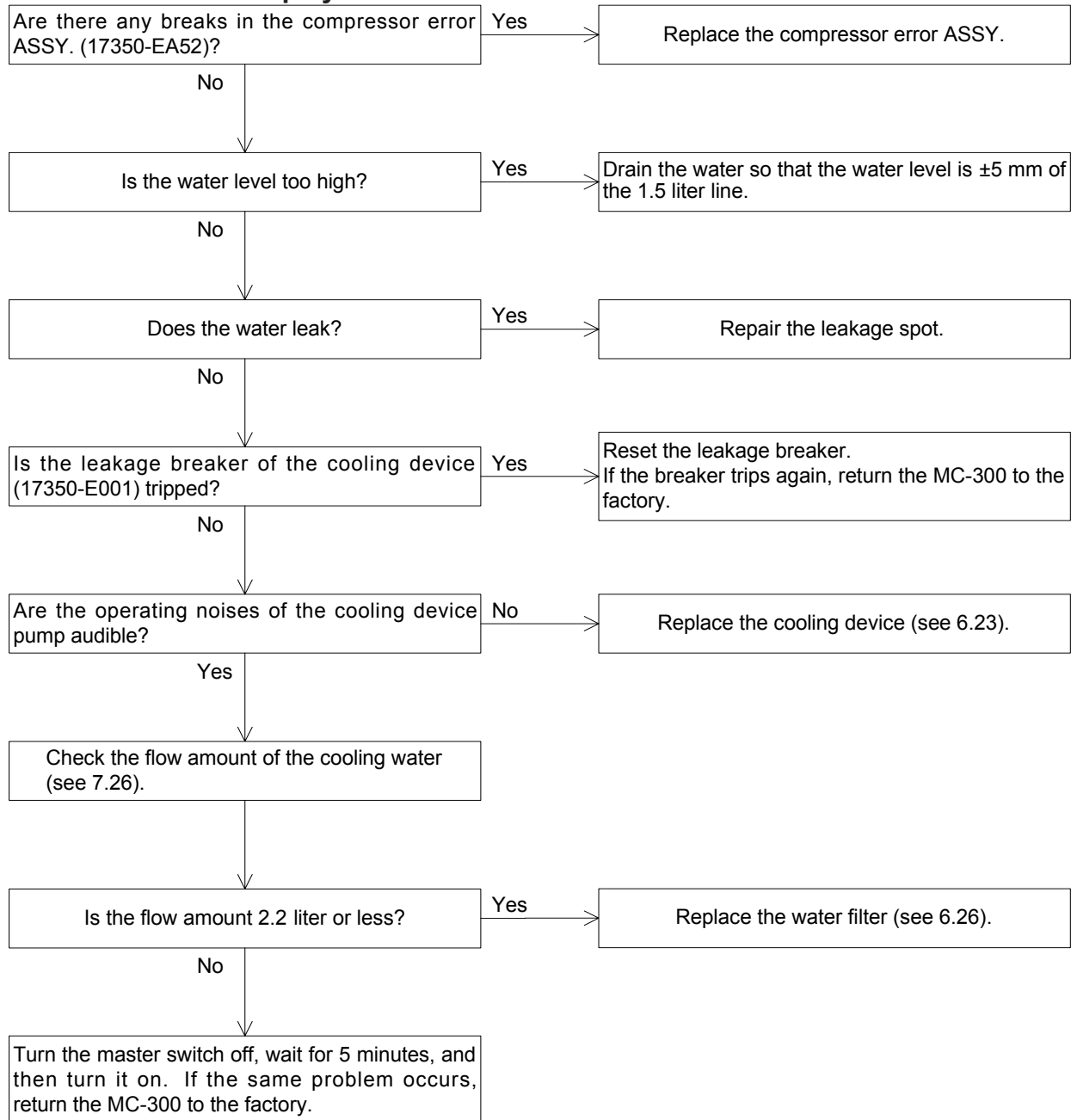


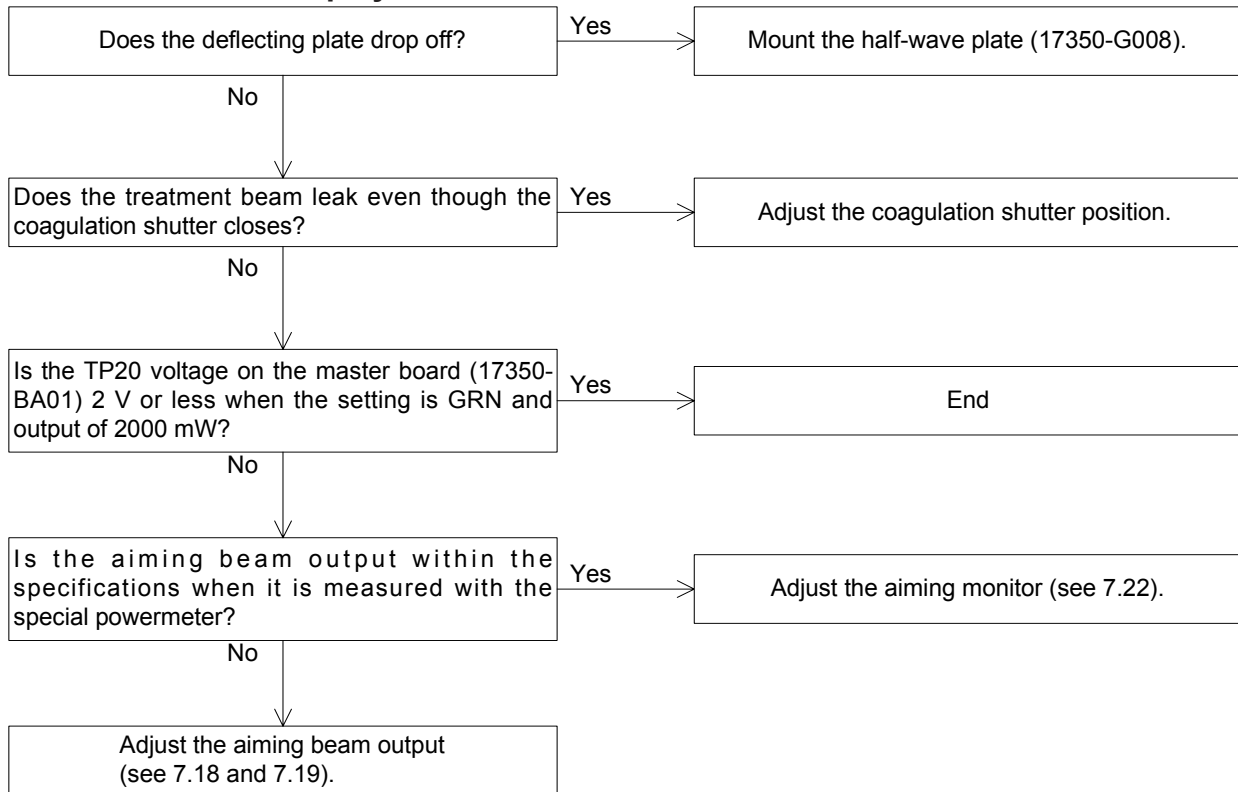
4.4.3 INTLK 2.8 is displayed.

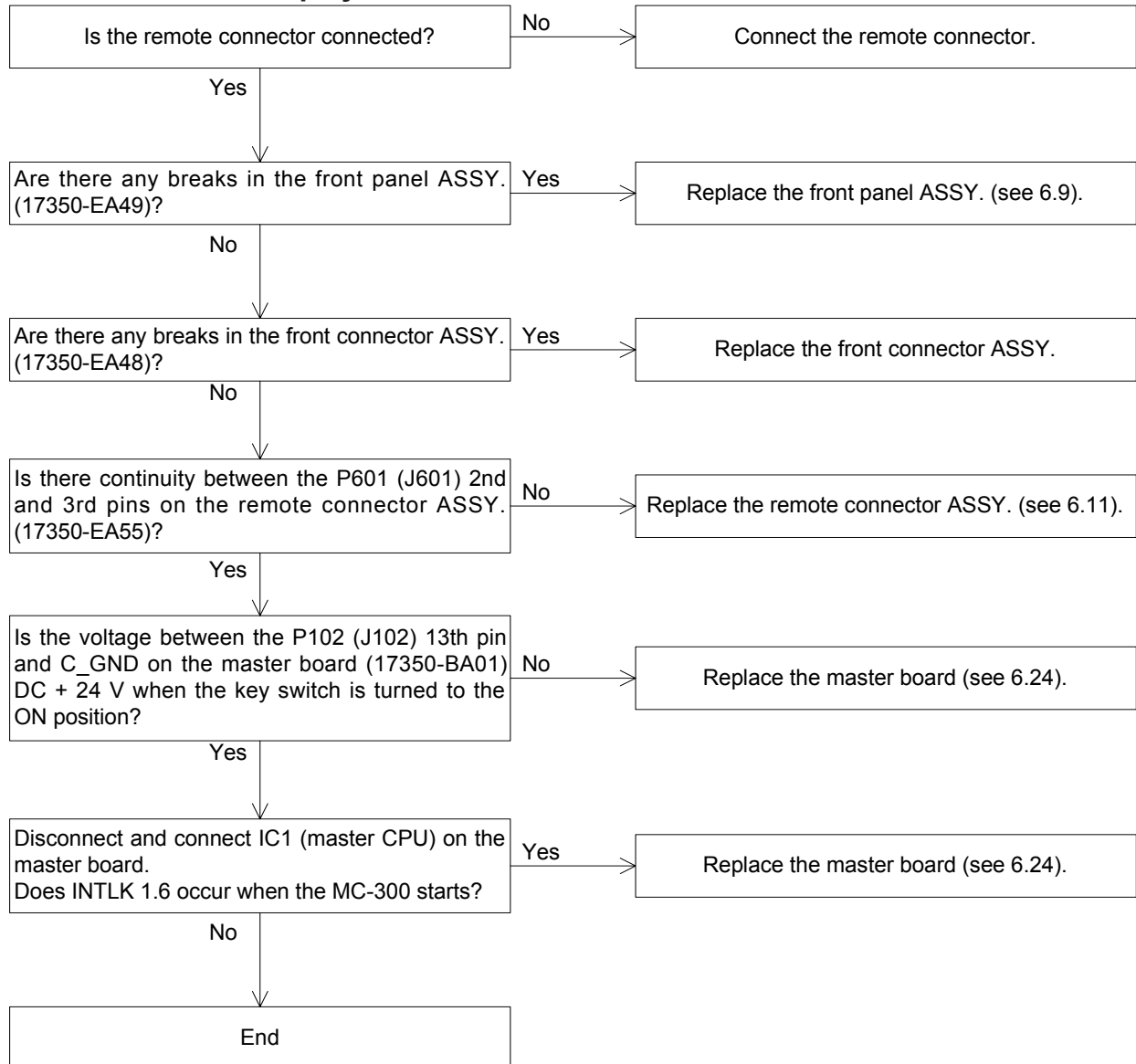
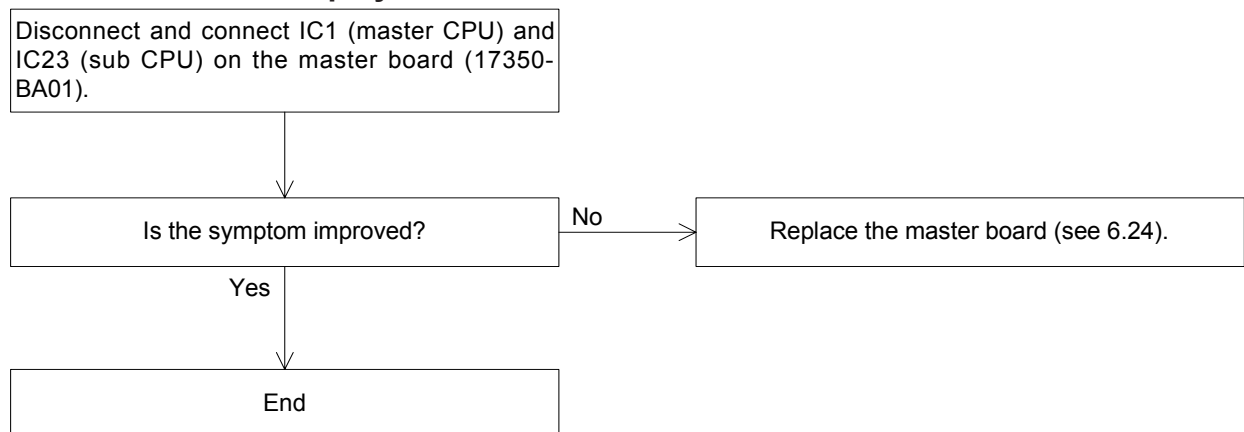


4.4.4 INTLK 3.2 is displayed.**4.4.5 INTLK 3.5 is displayed.**

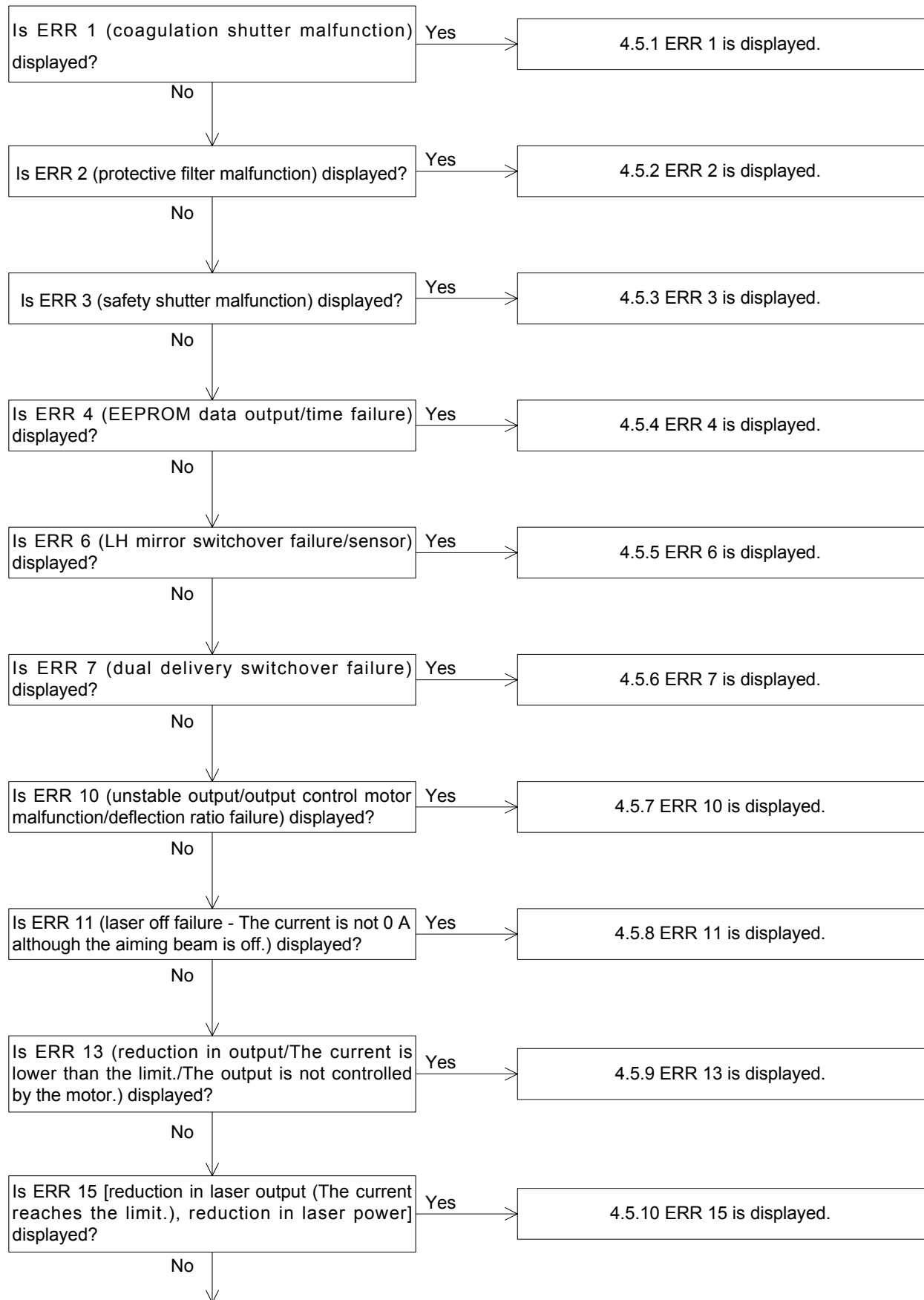
Check the compressor error ASSY. (17350-EA52). Turn the master switch off. In five minutes, turn it on. If the symptom occurs, return the MC-300 to the factory.

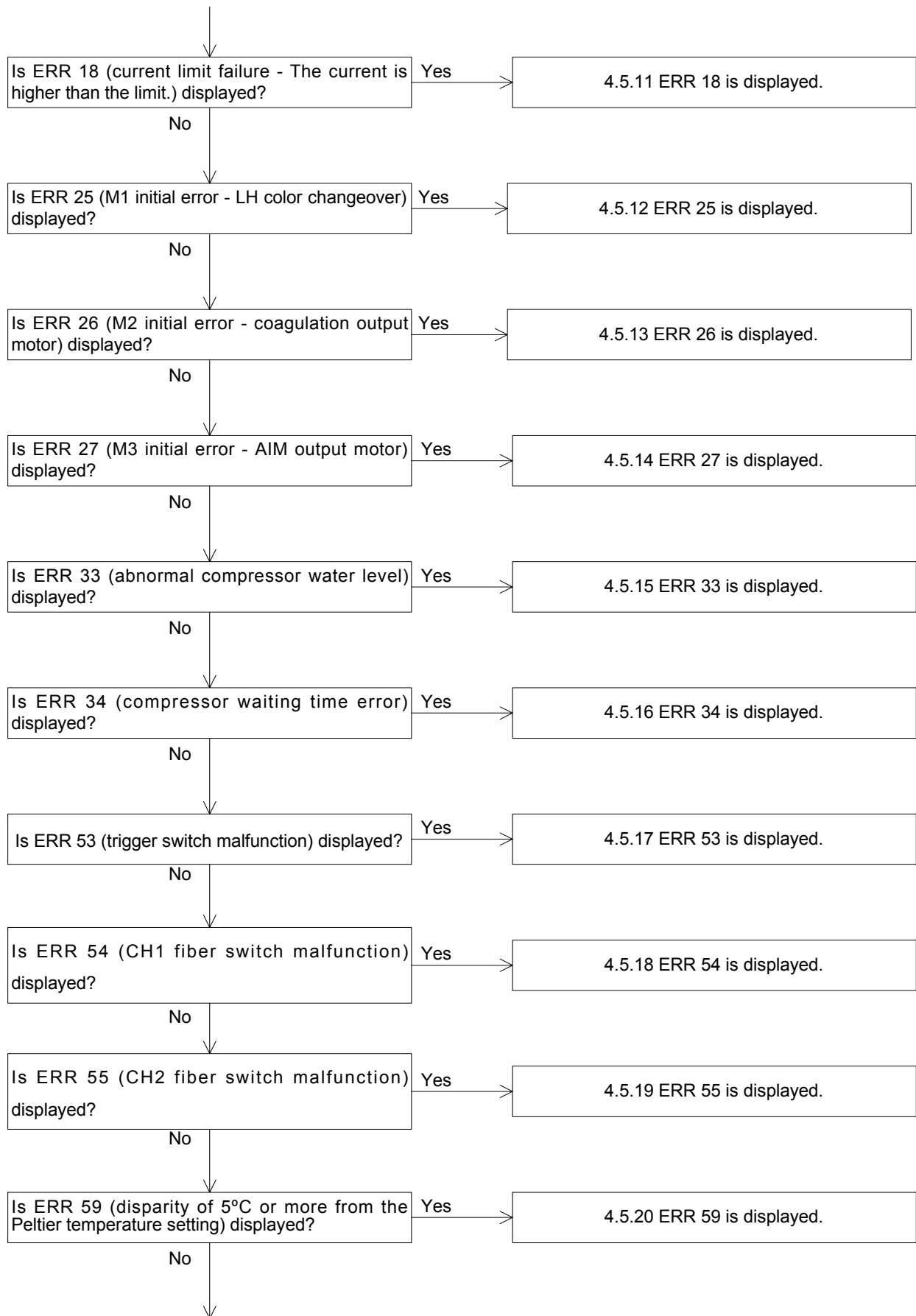
4.4.6 INTLK 4.5 is displayed.

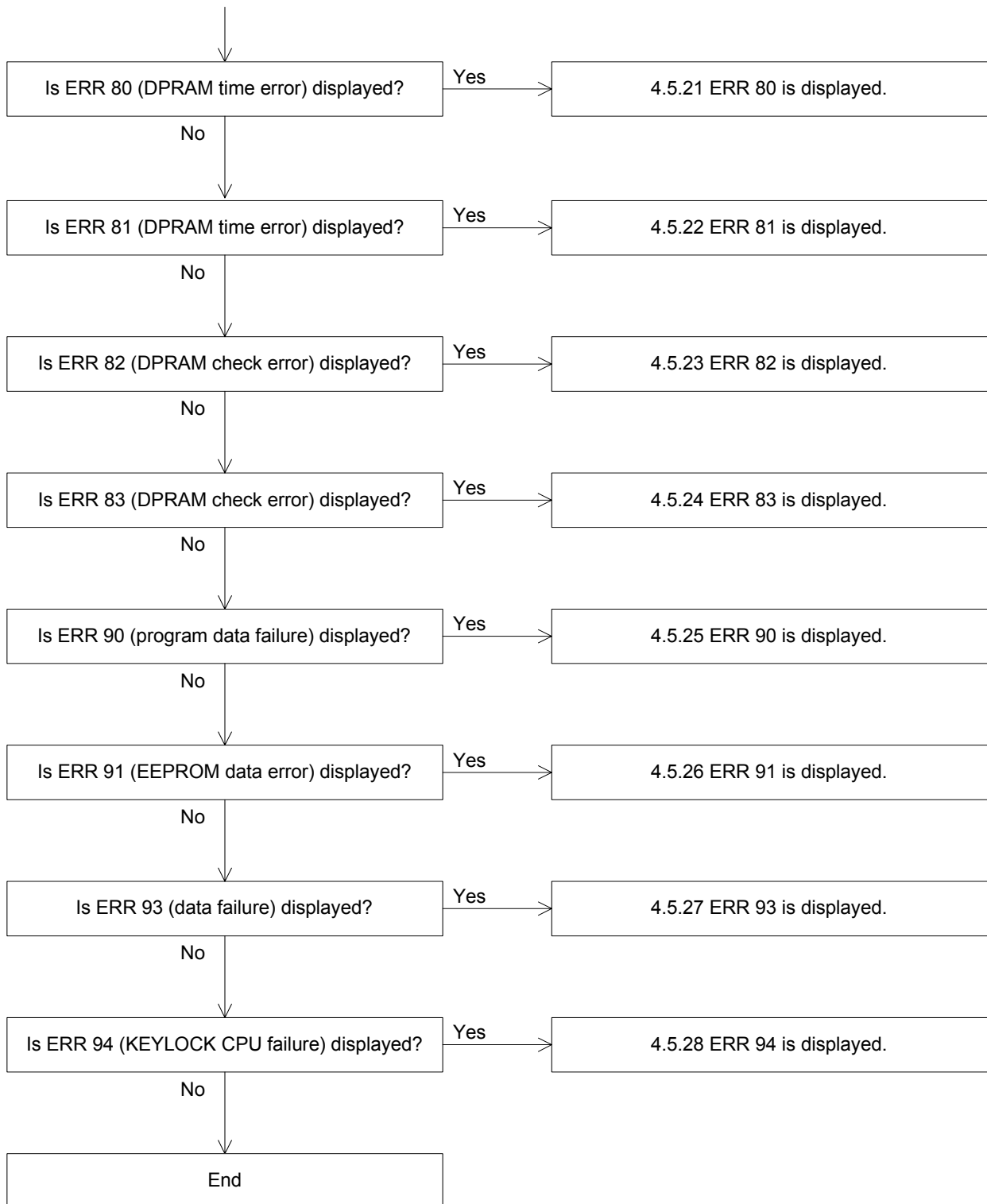
4.4.7 INTLK 5.1 is displayed.

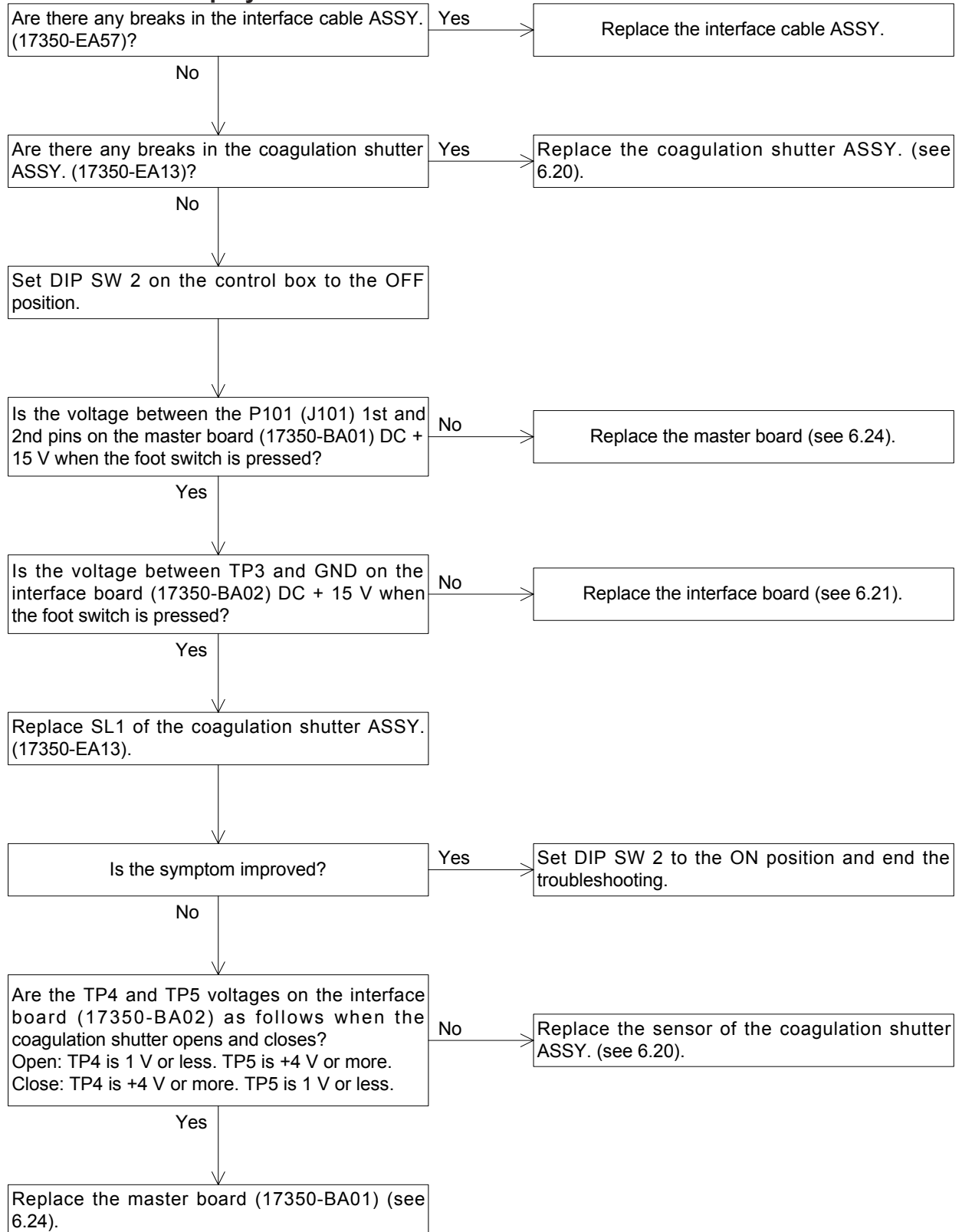
4.4.8 INTLK 6.3 is displayed.**4.4.9 INTLK 9.9 is displayed.**

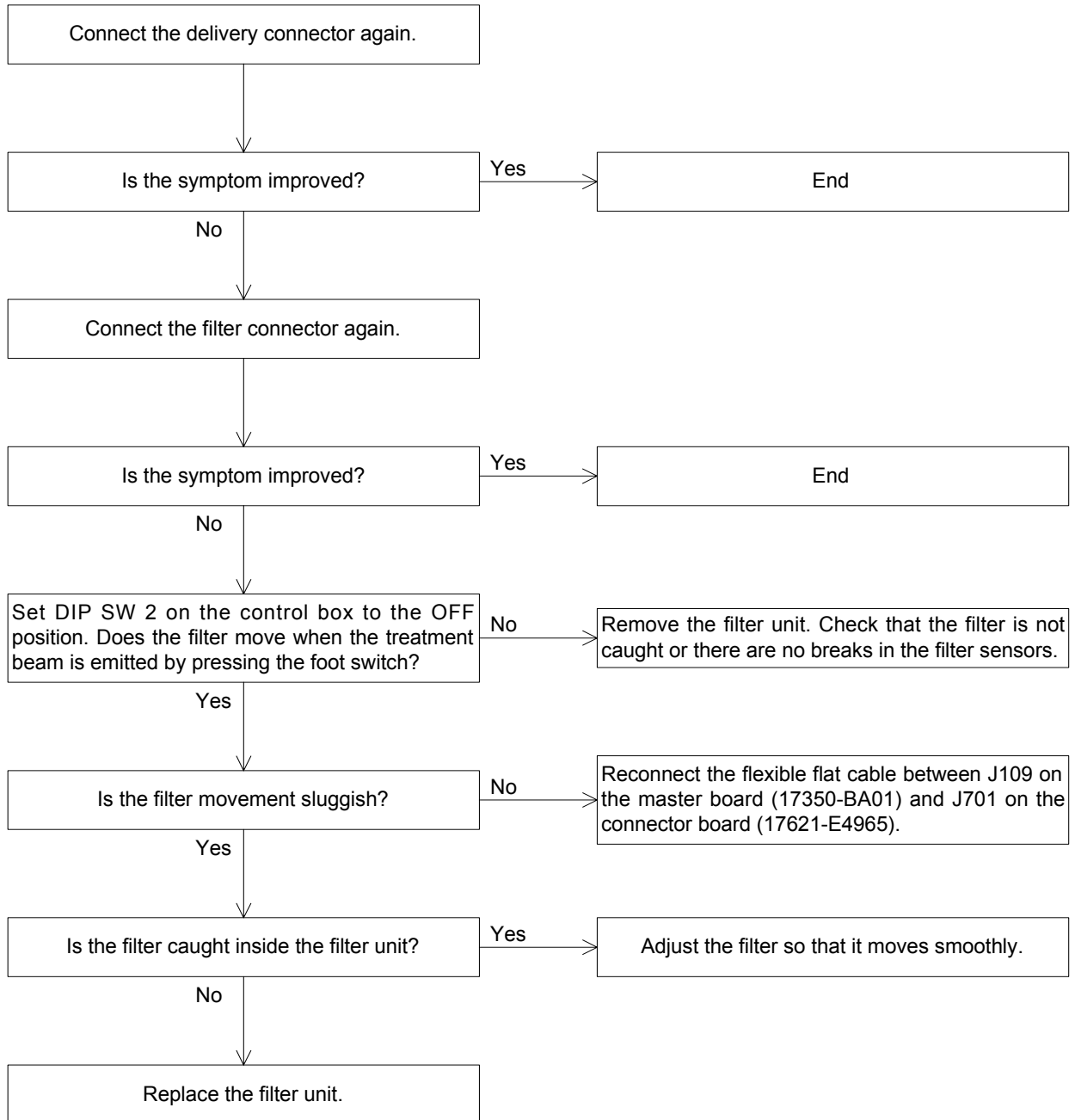
4.5 An Error (ERR) Number is Displayed.

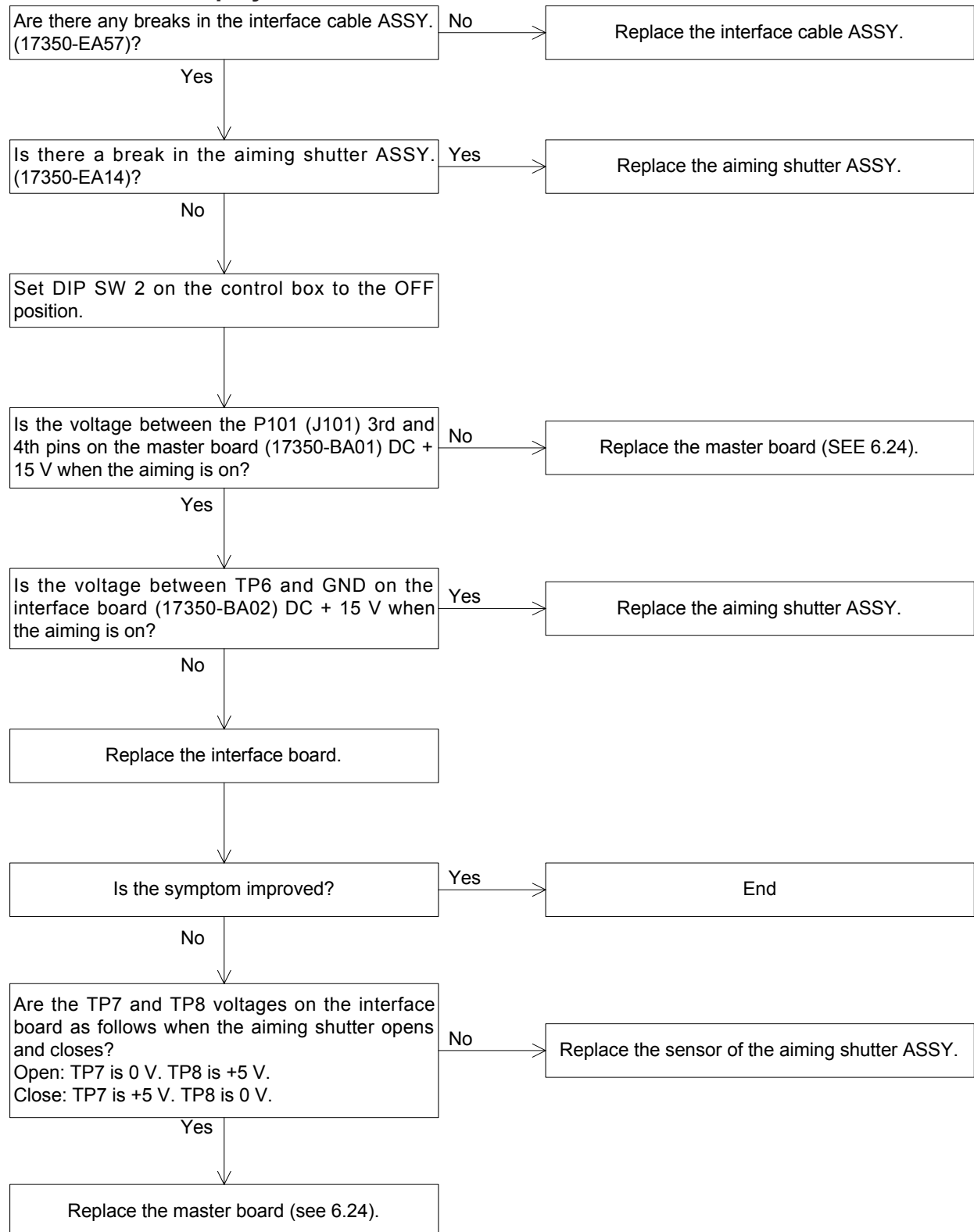




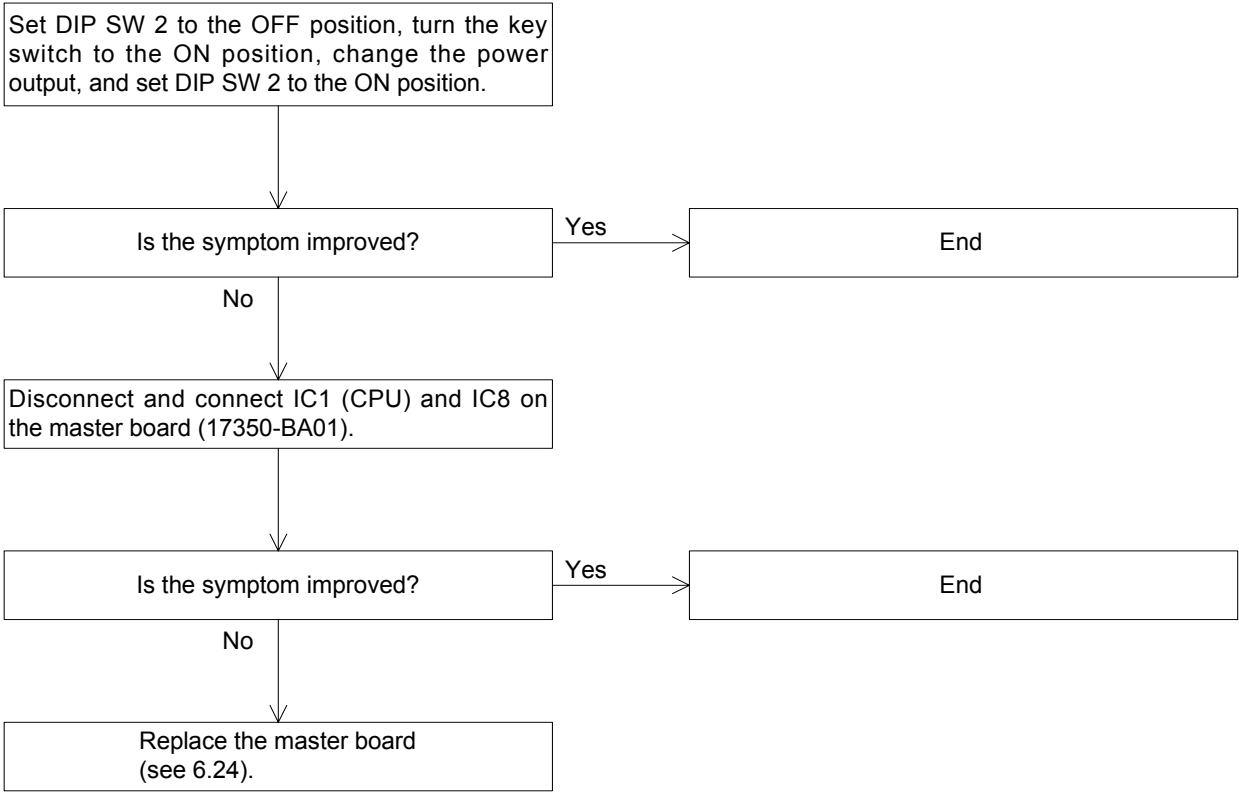


4.5.1 ERR 1 is displayed.

4.5.2 ERR 2 is displayed.

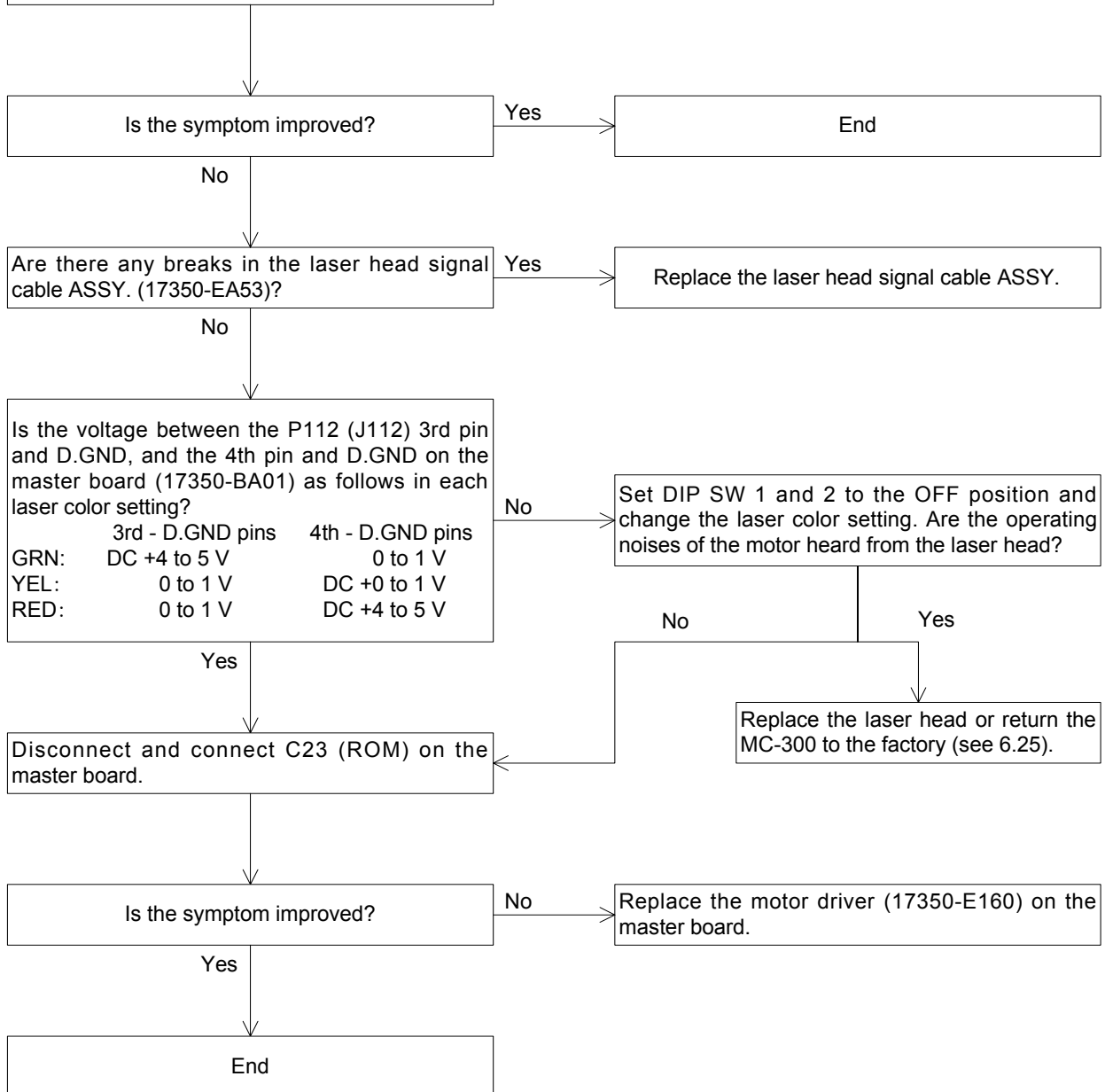
4.5.3 ERR 3 is displayed.

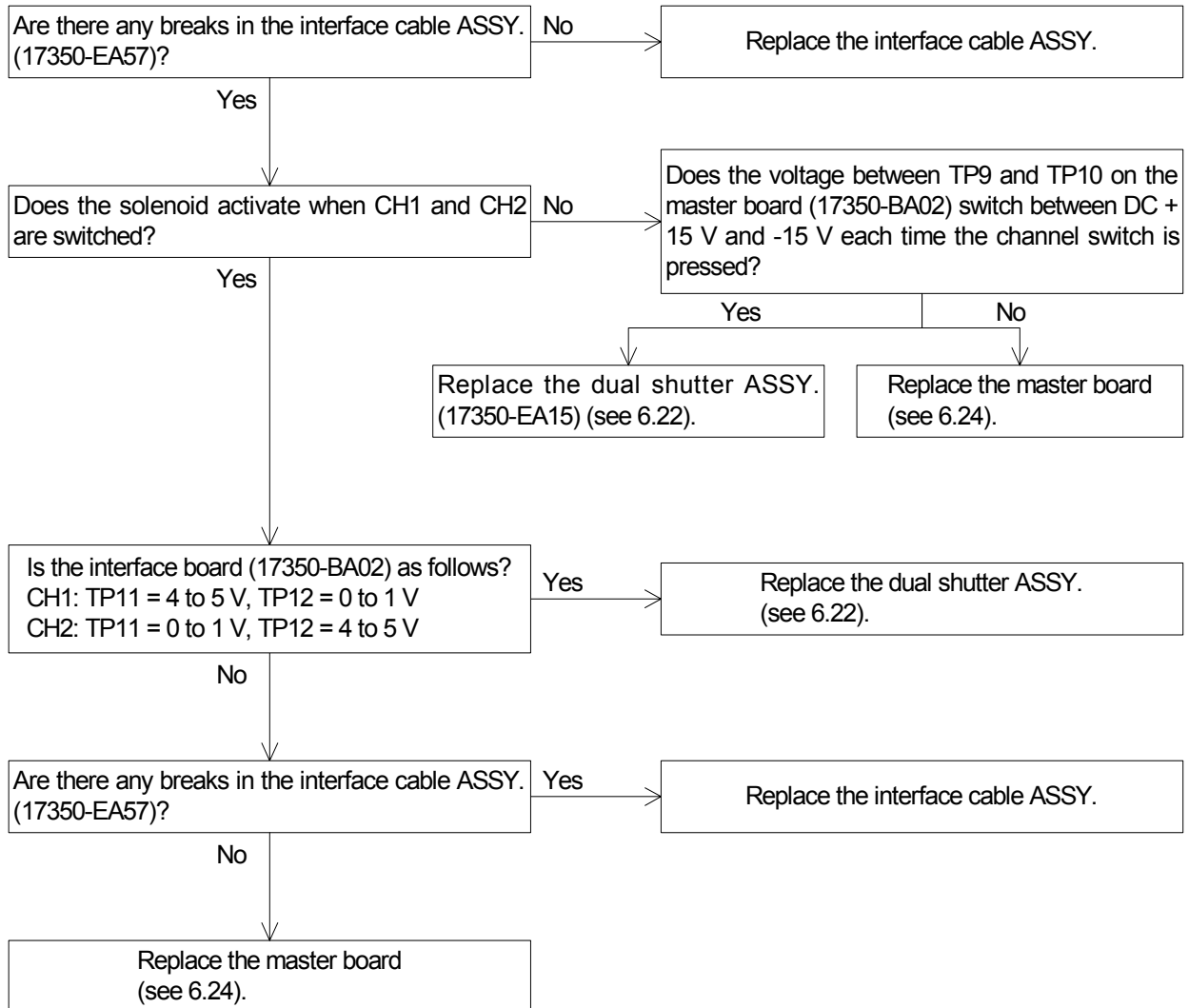
4.5.4 ERR 4 is displayed.



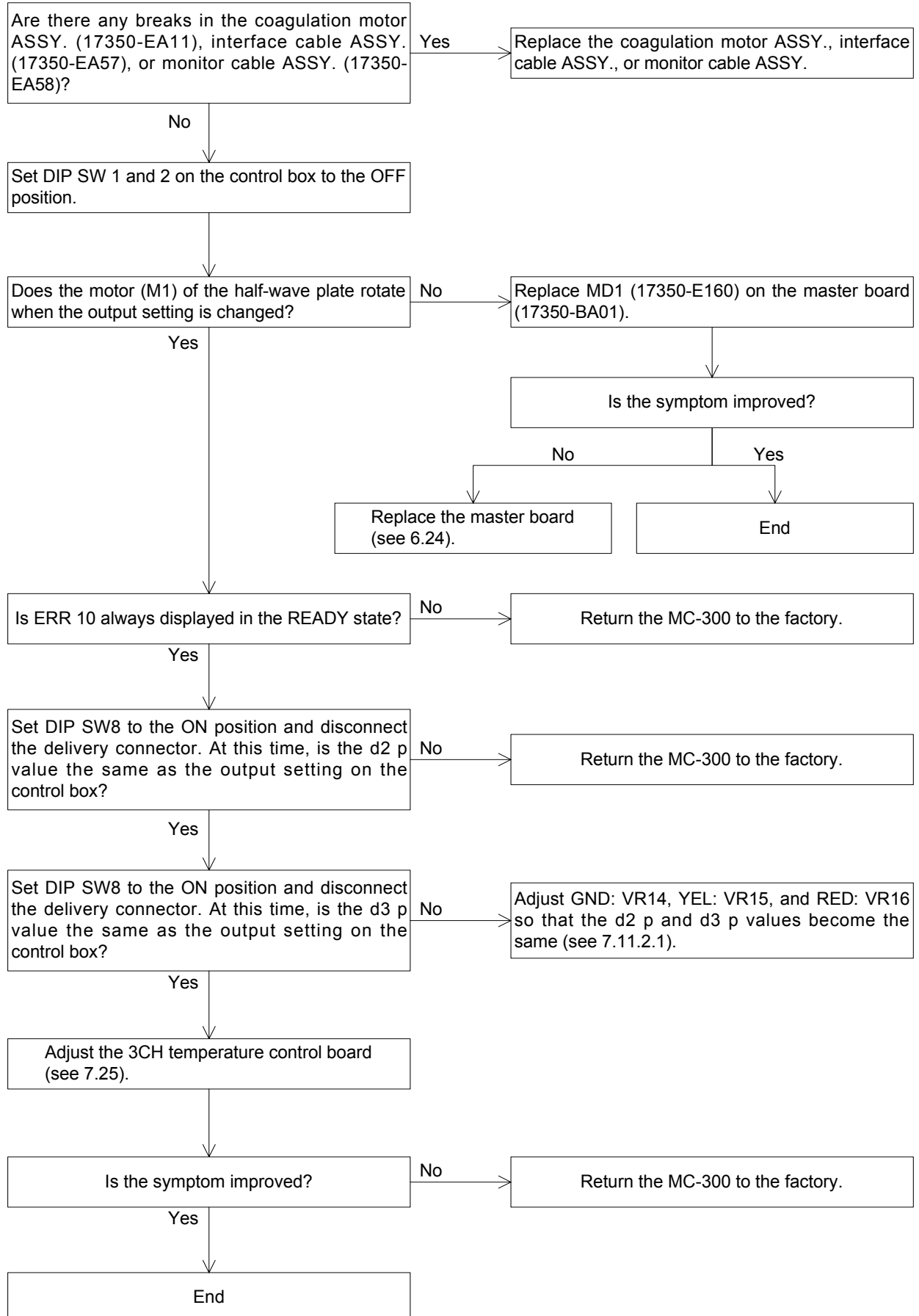
4.5.5 ERR 6 is displayed.

Disconnect and connect the connector on the LH signal cable ASSY. (17350-EA53).



4.5.6 ERR 7 is displayed.

4.5.7 ERR 10 is displayed.



4.5.8 ERR 11 is displayed.

Remove the shutter cover. Check that the laser does not oscillate when the aiming is off.

Clamp the current clamp tester to either of the LD cable ends and measure the current when aiming is off. Is the measured current 0 A within the tolerance of the clamp tester?

Yes

Replace the master board (see 6.24).

Replace the LD power supply (17350-E005) (see 6.5).

Is the voltage between TP11 and A_GND on the master board (17350-BA01) 0 V $\pm$ 0.1 V when the aiming is off?

Yes

Is the voltage between TP10 and A_GND on the master board (17350-BA01) 0.1 V or less when the aiming is off?

Yes

Return the MC-300 to the factory.

No

Is the voltage between the P119 (J119) 1st pin and ISO_A_GND on the master board (17350-BA01) 1 V or less?

No

Yes

Are there any breaks in the LD driver ASSY. (17350-EA50)?

No

Yes

Replace the LD driver ASSY.

No

Adjust VR2 so that the voltage between TP11 and A_GND on the master board becomes 0 V $\pm$ 0.1 V.

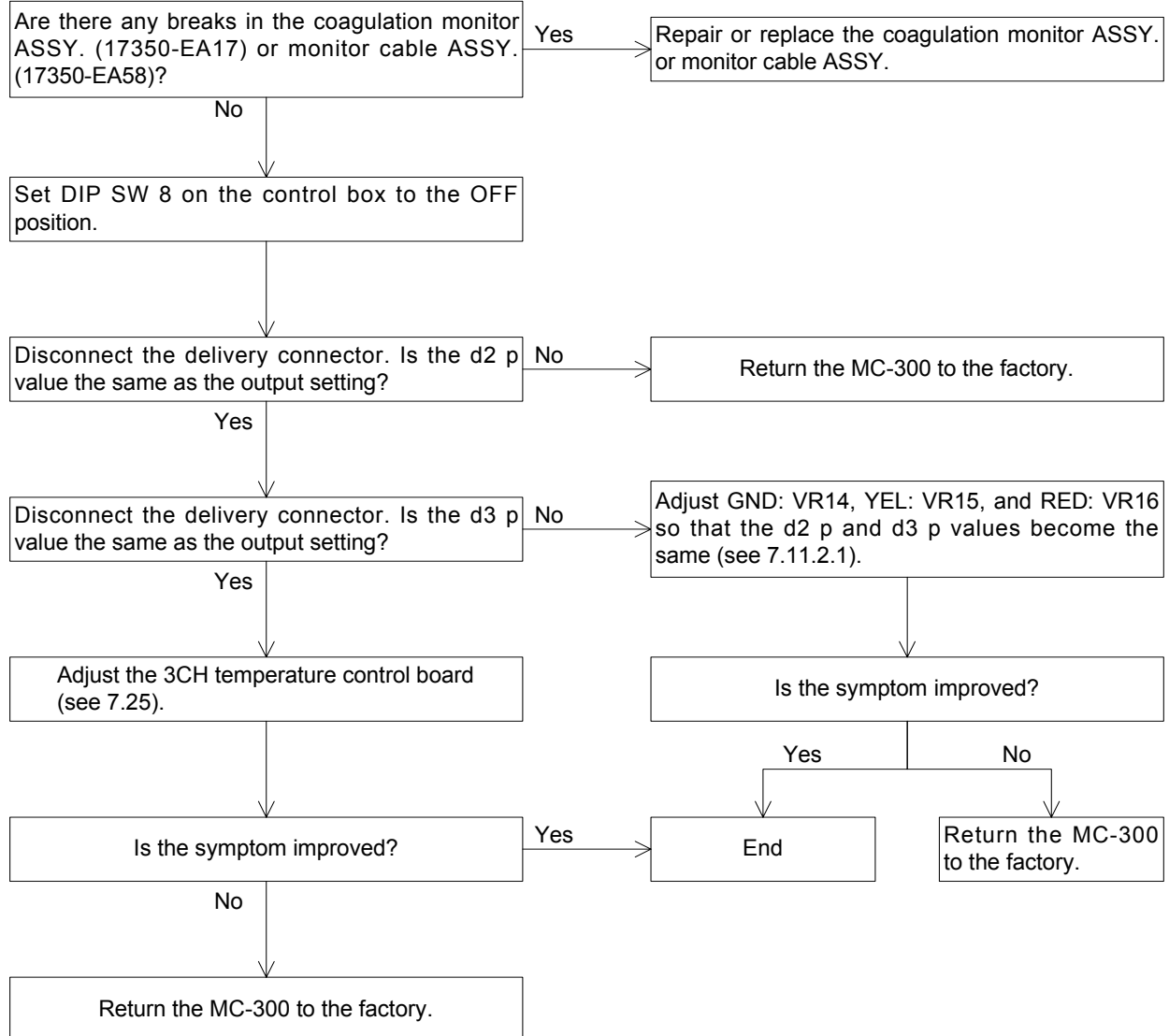
No

Adjust VR8 so that the voltage between TP10 and A_GND on the master board becomes 0 V $\pm$ 0.1 V.

4.5.9 ERR 13 is displayed.

Set parameter for Address 69 to 1.

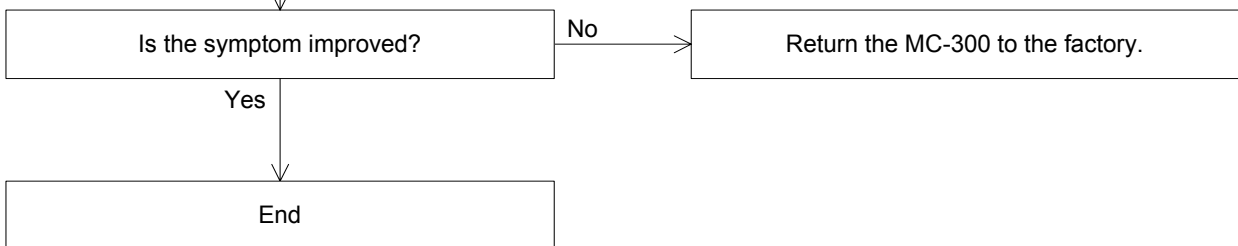
4.5.10 ERR 15 is displayed.



4.5.11 ERR 18 is displayed.

Disconnect the delivery connector, set DIP SW 1, 2, and 3 to the OFF position, and turn the aiming on. Increase the output of GRN from 50 mW to 1000 mW gradually.

Adjust VR7 so that the voltage between TP10 and A_GND becomes 1.5 V.

**4.5.12 ERR 25 is displayed.**

Are there any breaks in the LH signal cable ASSY. (17350-EA53)?

Yes

Replace the LH signal cable ASSY.

No

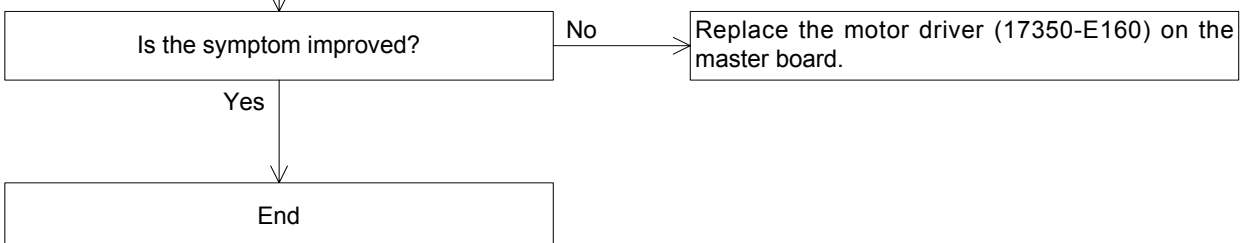
Is the operating noises of the LH motor audible when the DIP SW 1 and 2 are set to the OFF position and the laser color is changed?

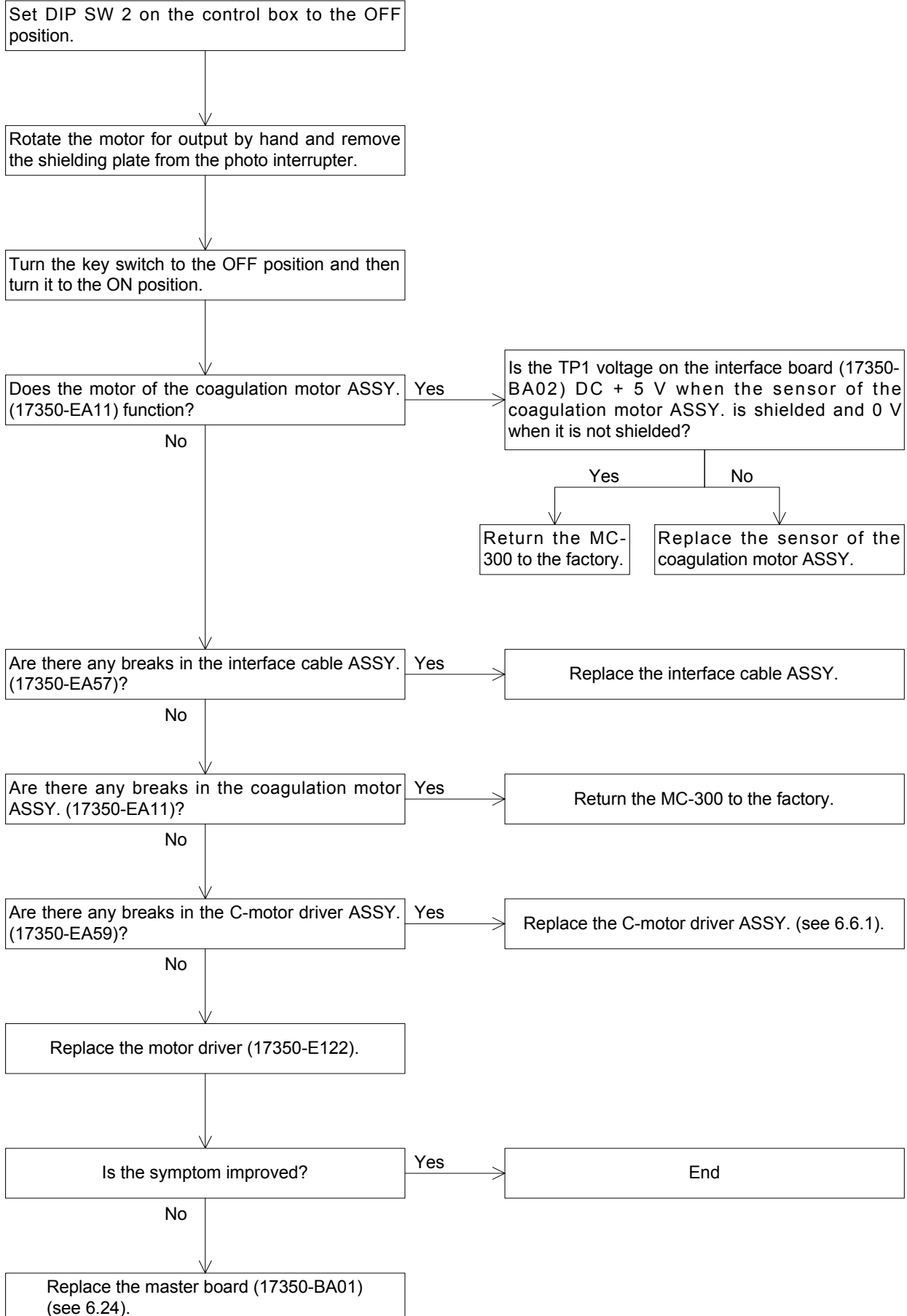
Yes

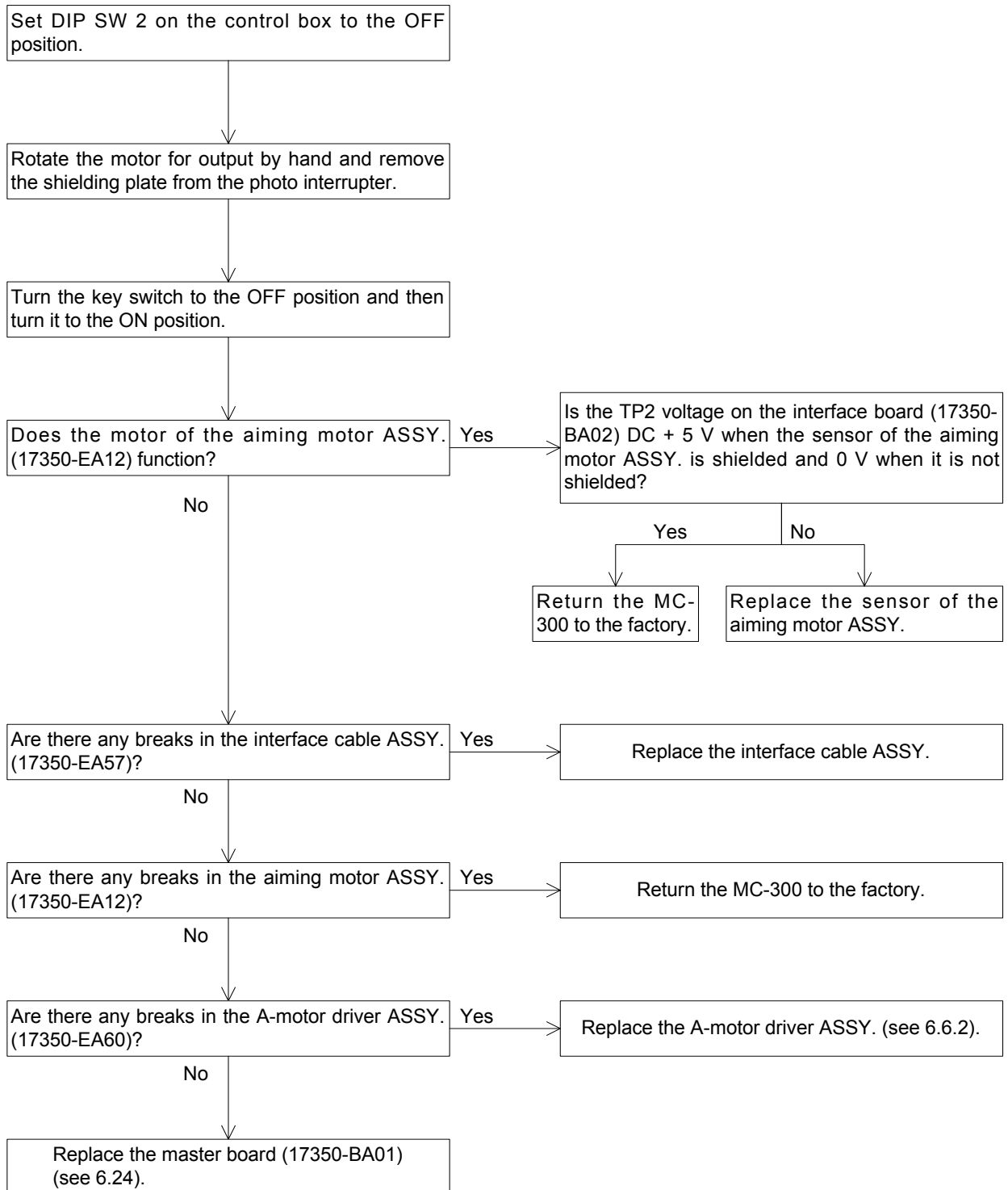
Replace the laser head or return the MC-300 to the factory (see 6.25).

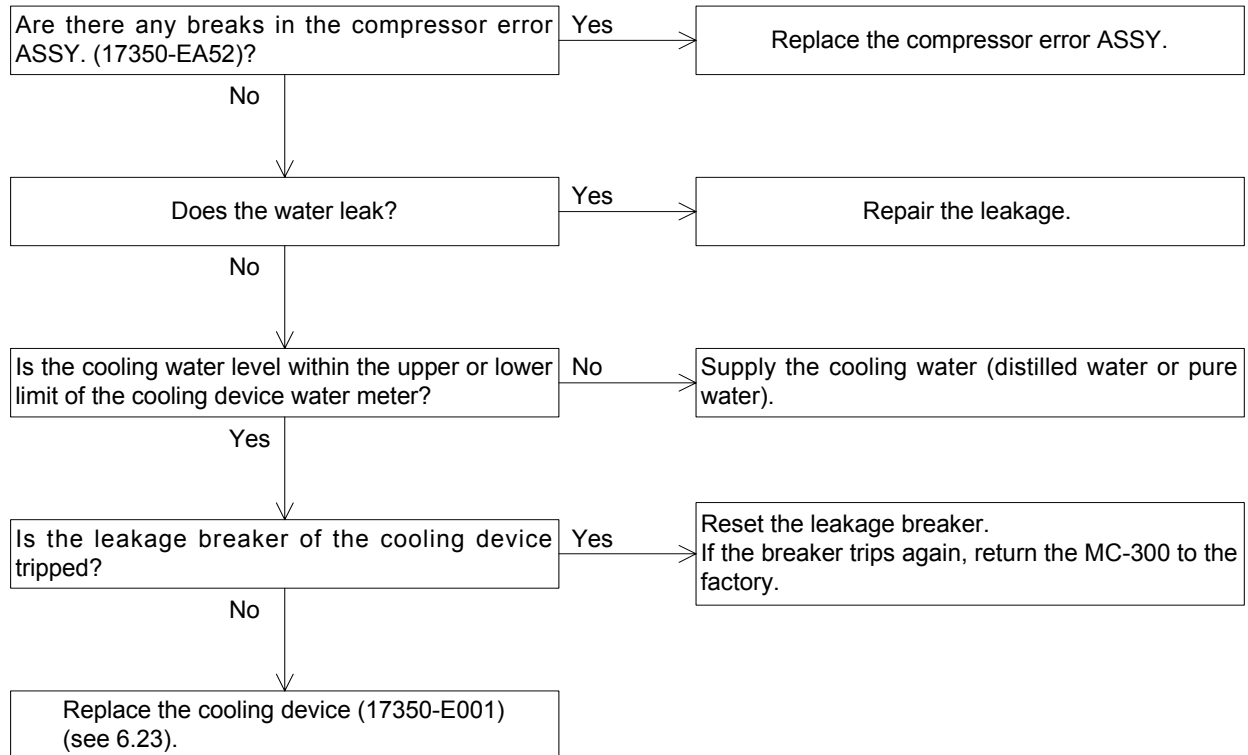
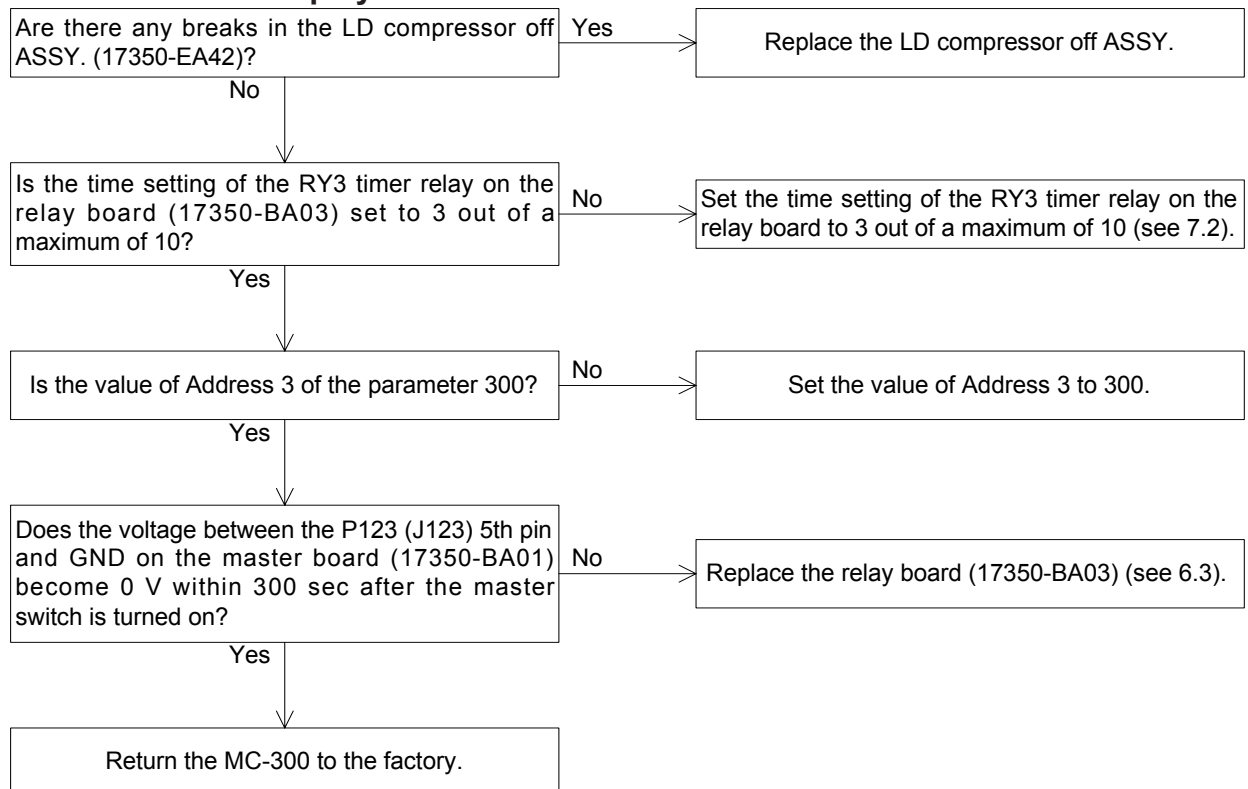
No

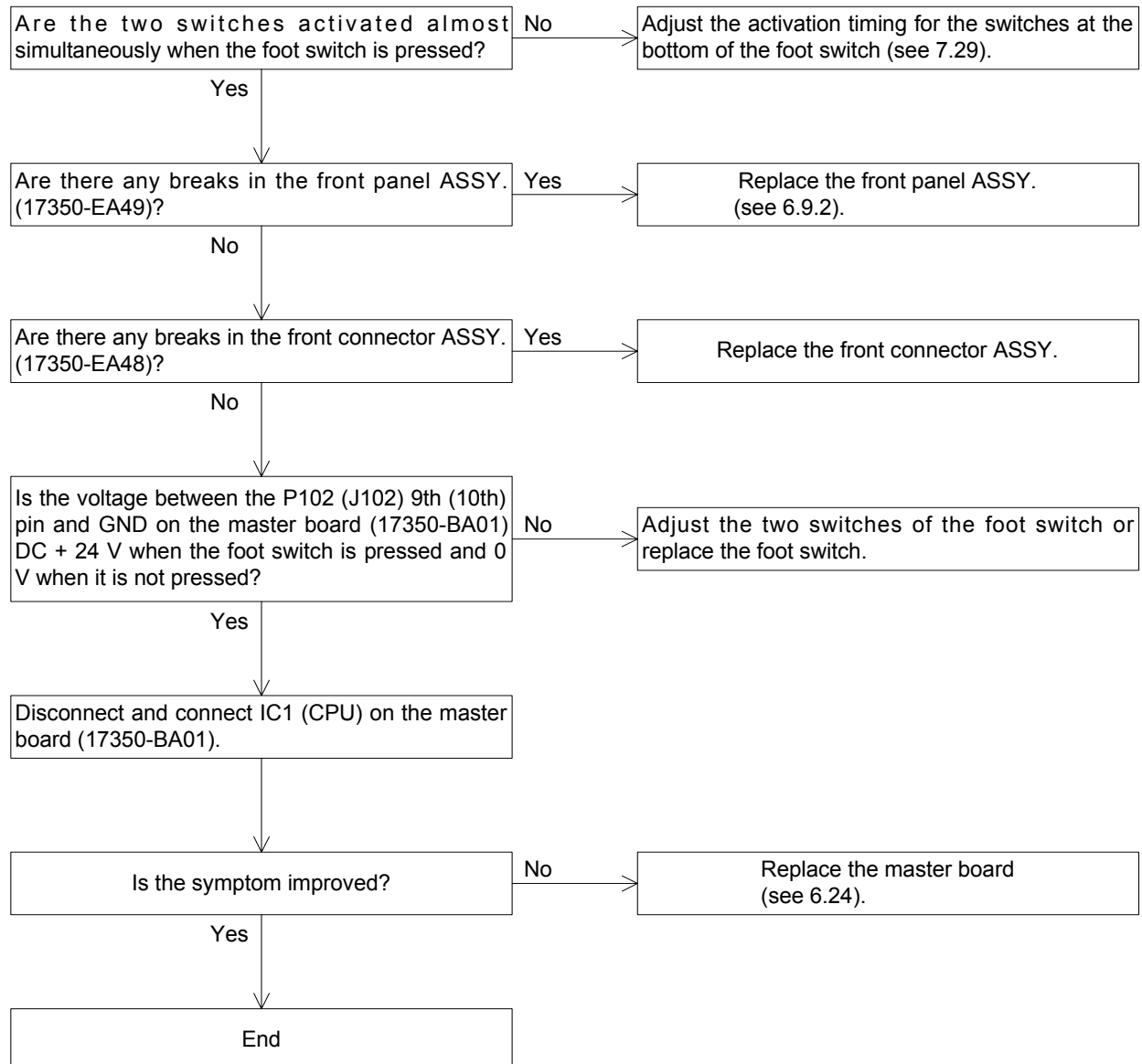
Disconnect and connect IC23 (ROM) on the master board (17350-BA01).



4.5.13 ERR 26 is displayed.

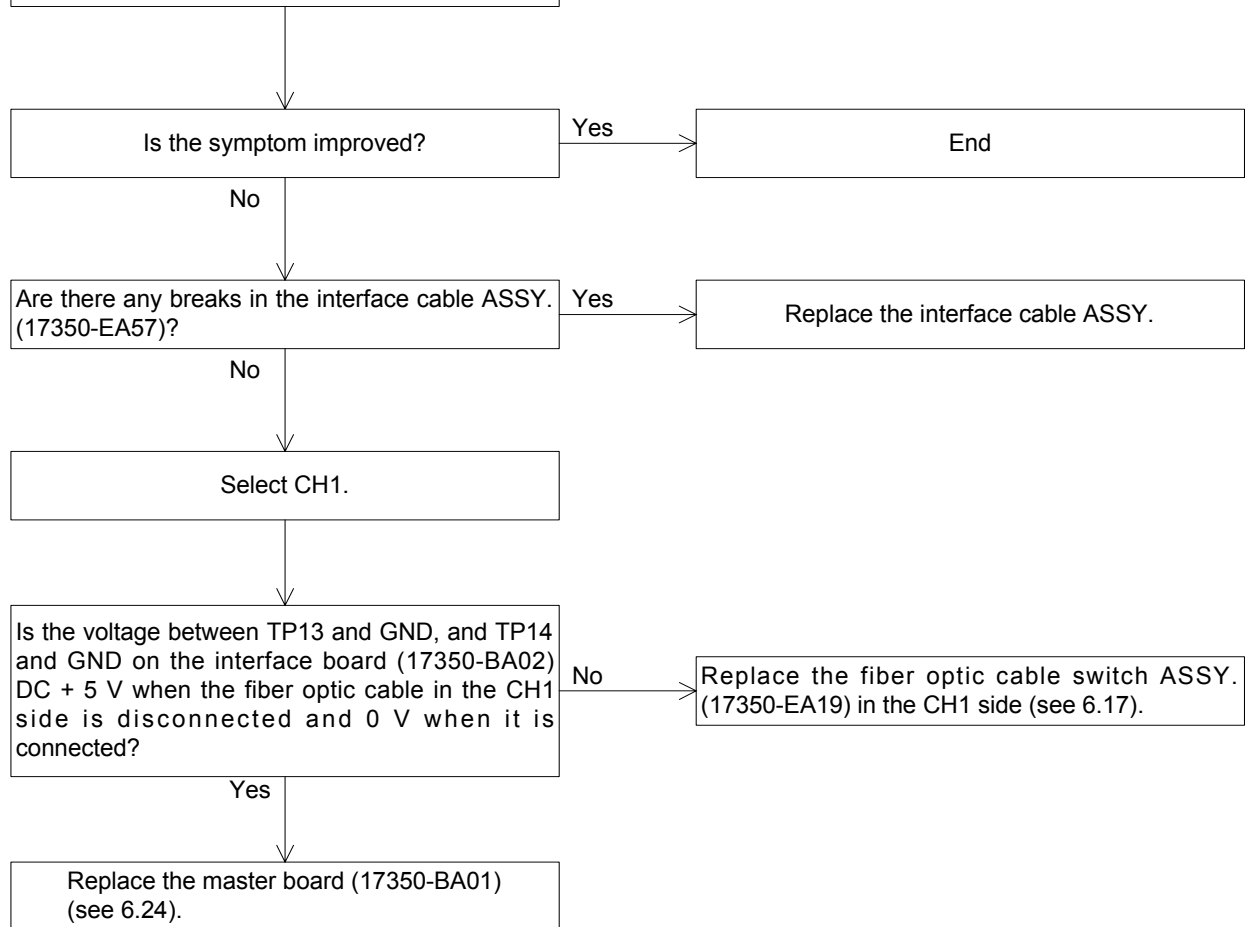
4.5.14 ERR 27 is displayed.

4.5.15 ERR 33 is displayed.**4.5.16 ERR 34 is displayed.**

4.5.17 ERR 53 is displayed.

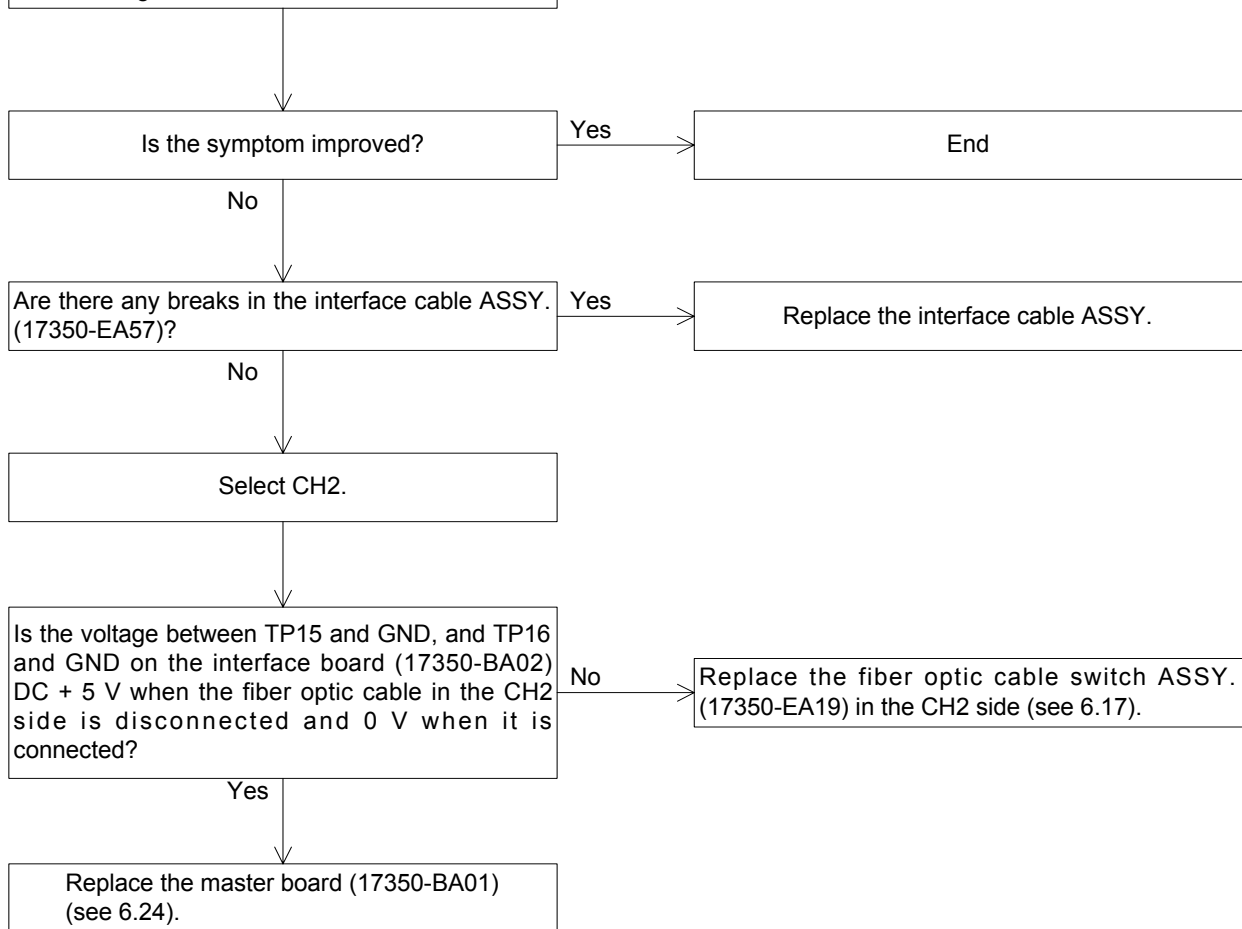
4.5.18 ERR 54 is displayed.

Disconnect the fiber optic cable of CH1 and connect it again.

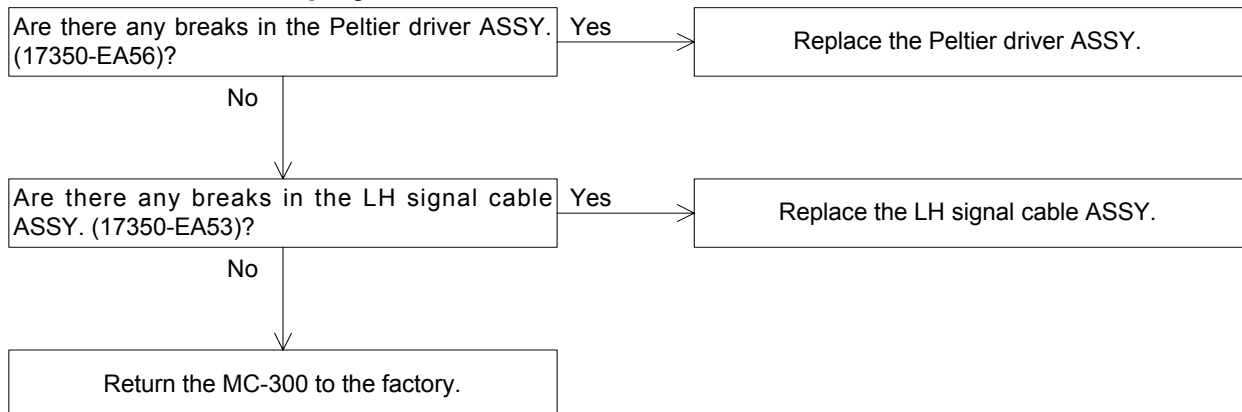


4.5.19 ERR 55 is displayed.

Disconnect the fiber optic cable of CH2 and connect it again.

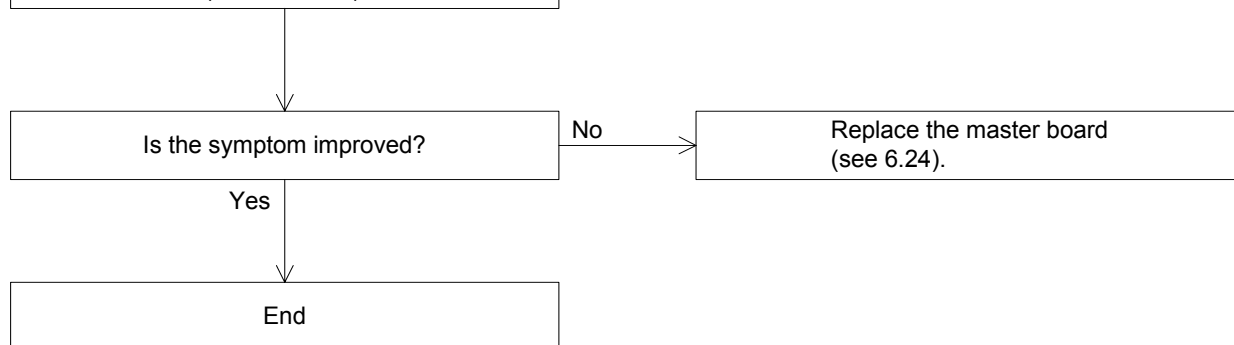
**4.5.20 ERR 59 is displayed.**

Are there any breaks in the Peltier driver ASSY. (17350-EA56)?



4.5.21 ERR 80 is displayed.

Disconnect and connect IC1 and IC23 (CPU) on the master board (17350-BA01).



4.5.22 ERR 81 is displayed.

See “4.5.21 ERR 80 is displayed”.

4.5.23 ERR 82 is displayed.

See “4.5.21 ERR 80 is displayed”.

4.5.24 ERR 83 is displayed.

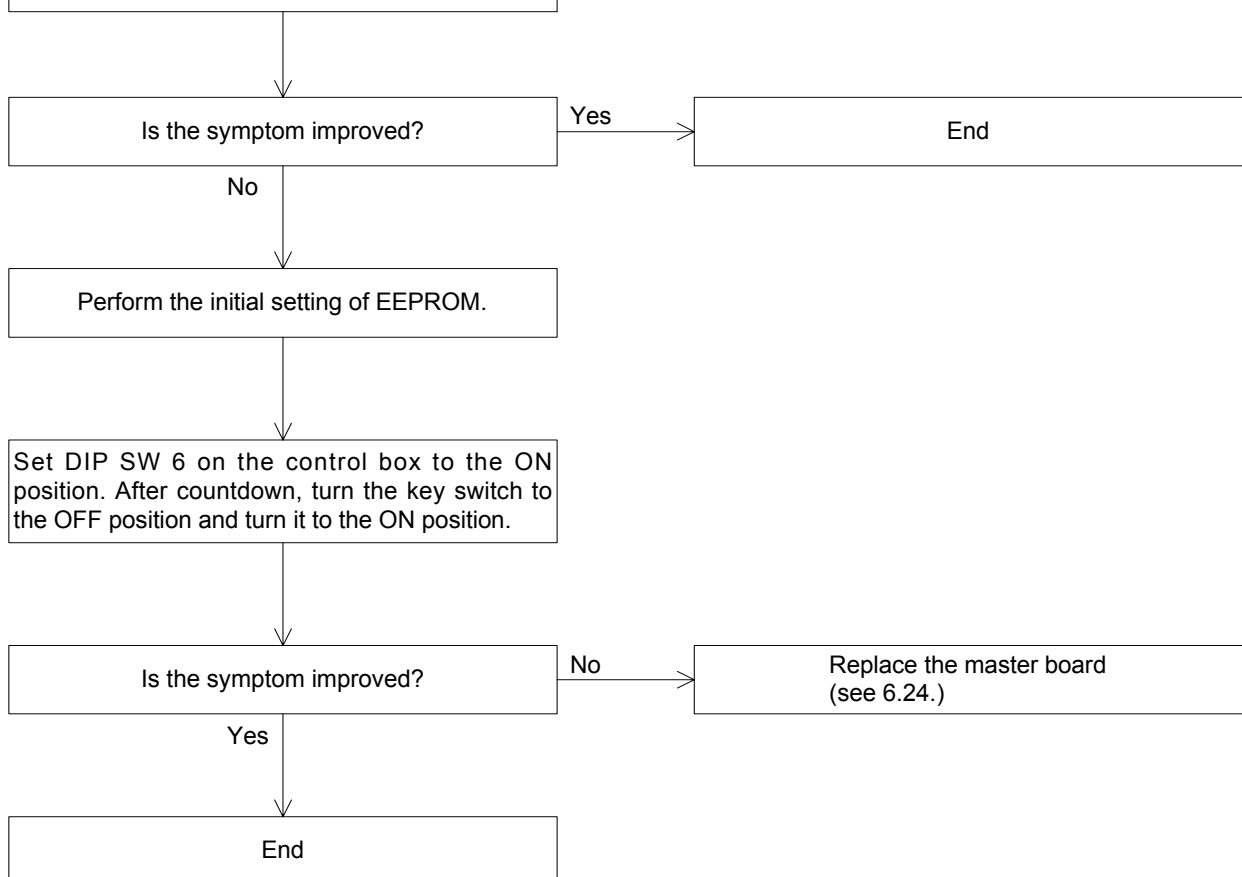
See “4.5.21 ERR 80 is displayed”.

4.5.25 ERR 90 is displayed.

See “4.5.21 ERR 80 is displayed”.

4.5.26 ERR 91 is displayed.

Disconnect and connect IC8 and IC1 (CPU) on the master board (17350-BA01). Start the MC-300.



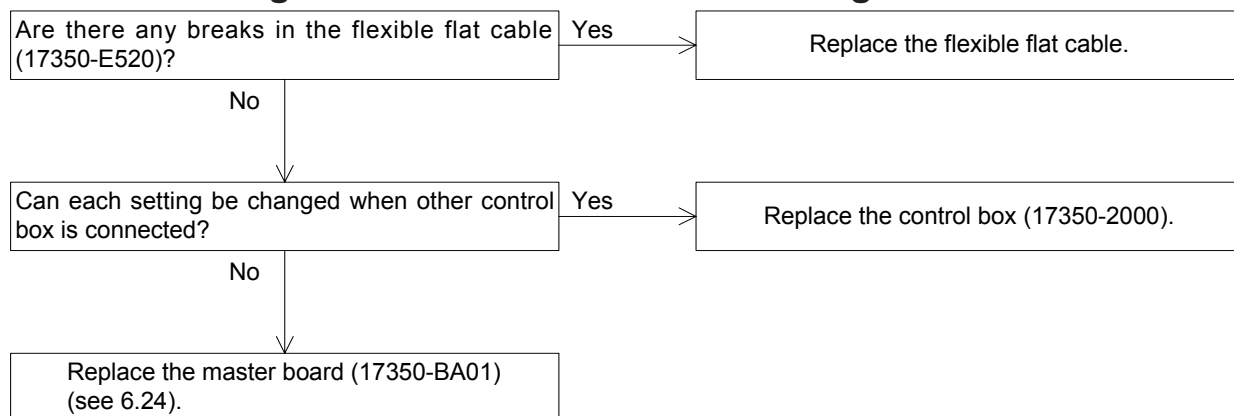
4.5.27 ERR 93 is displayed.

See “4.5.21 ERR 80 is displayed”.

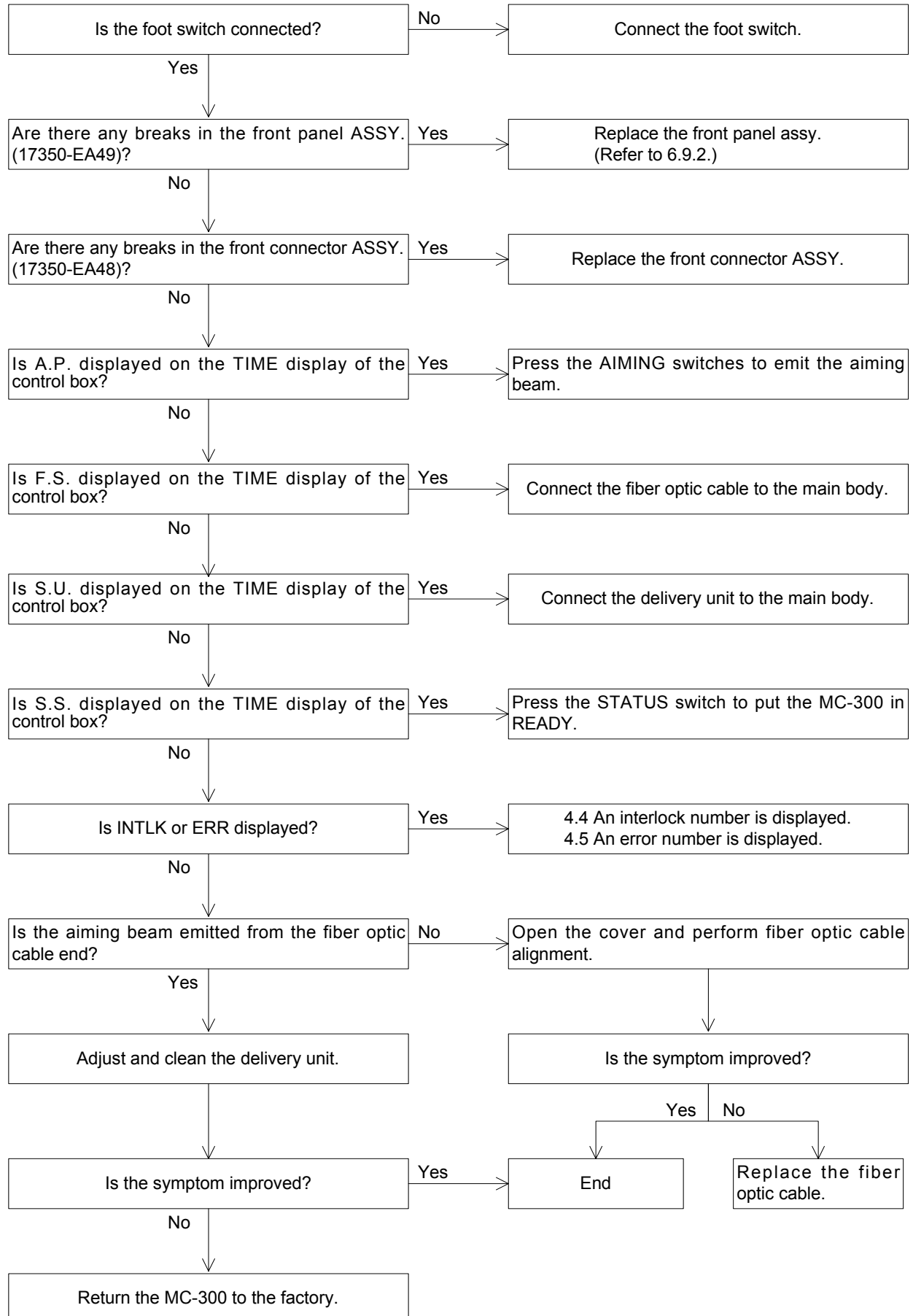
4.5.28 ERR 94 is displayed.

See “4.5.21 ERR 80 is displayed”.

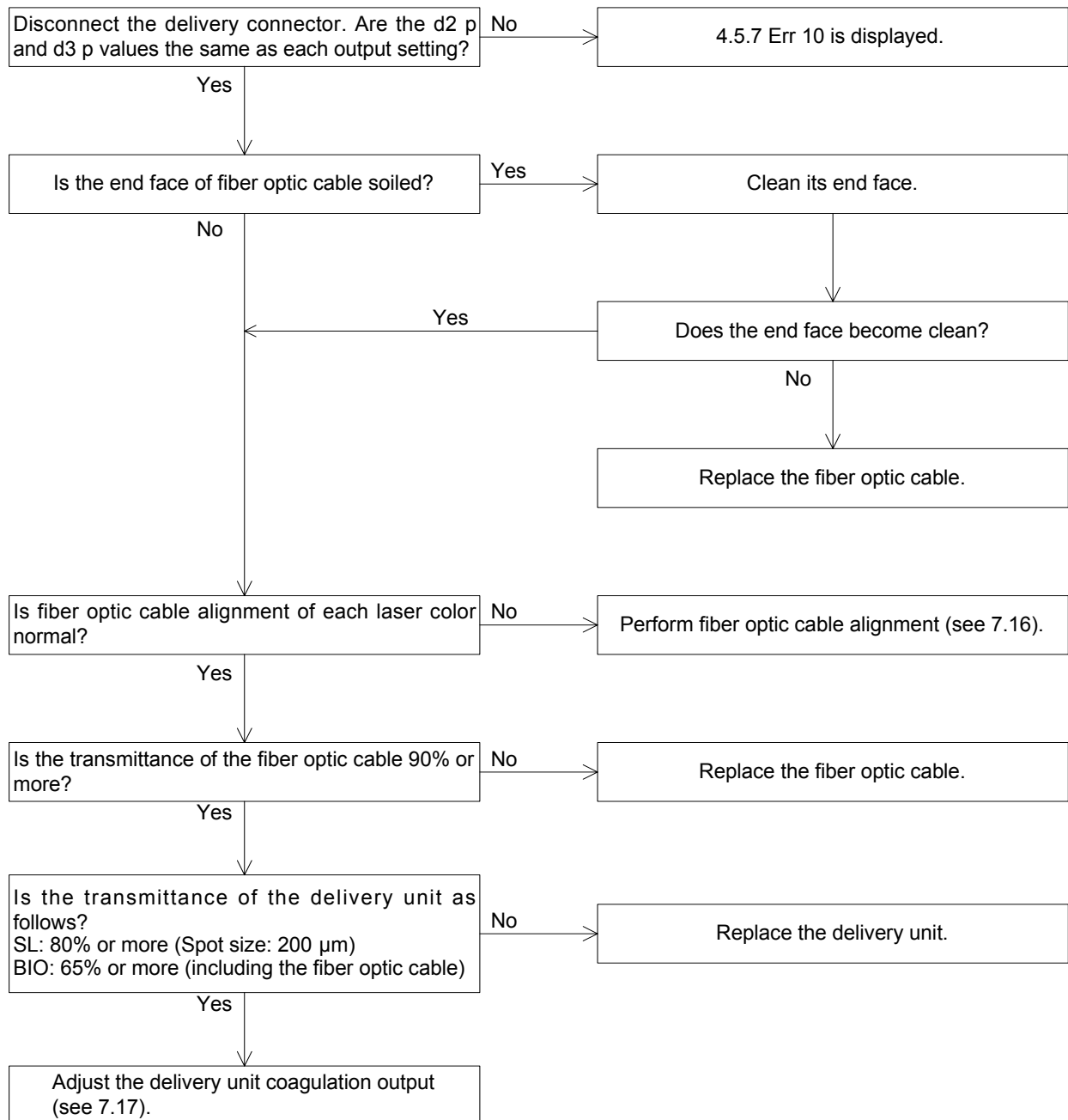
4.6 Each Setting of Control Box can not be Changed.



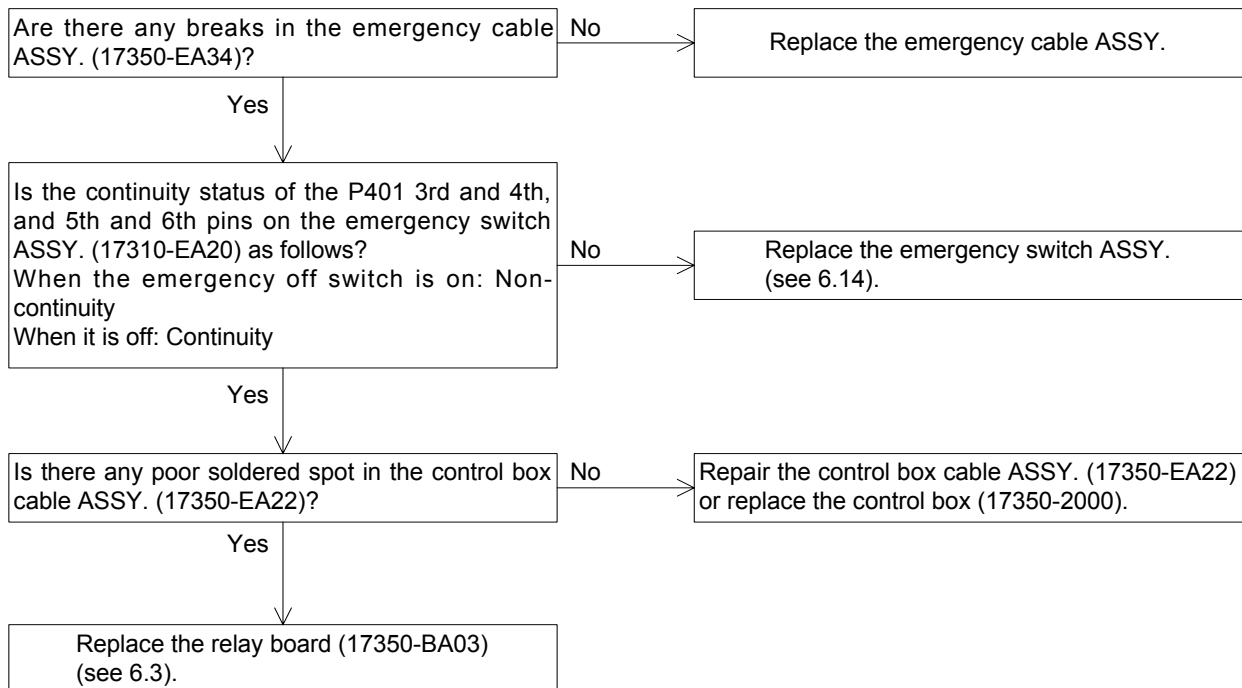
4.7 Laser Beam is not Emitted.



4.8 Actual Output is out of Standards.



4.9 Emergency Off Switch does not Work.

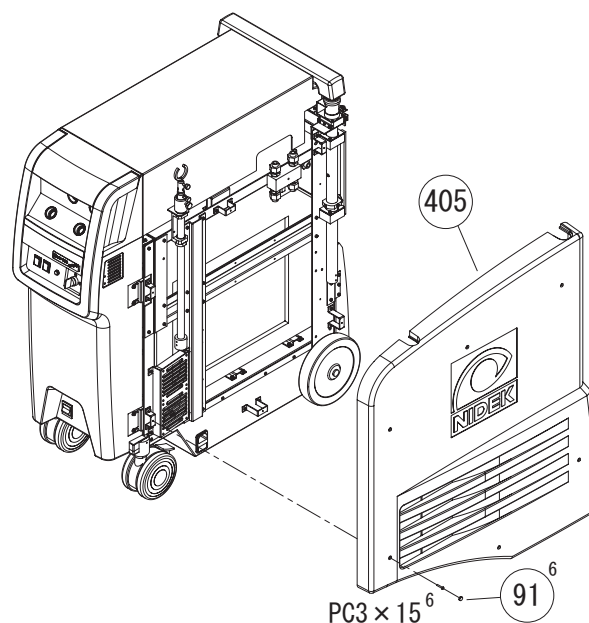


§5 REMOVING PROCEDURES

5.1 Covers

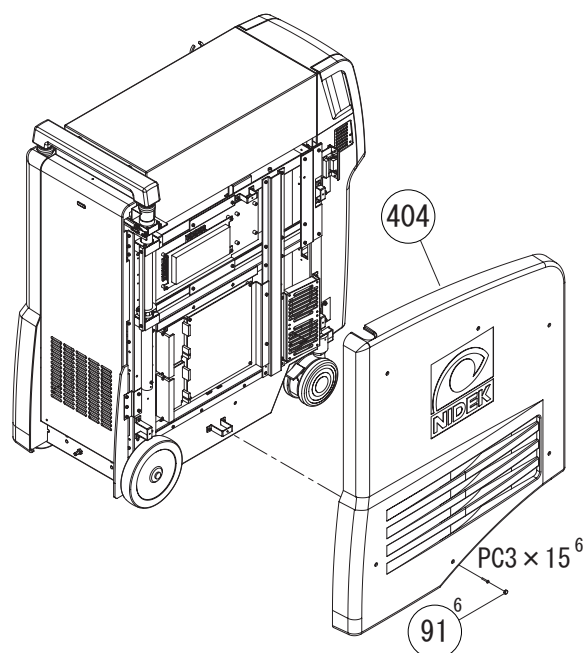
5.1.1 Left cover

1. Remove the screw caps [32906-M091 (n = 6)].
2. Unscrew PC3 × 15 (n = 6) to remove the left cover (17350-M405).
3. Reassemble the parts in reverse order.



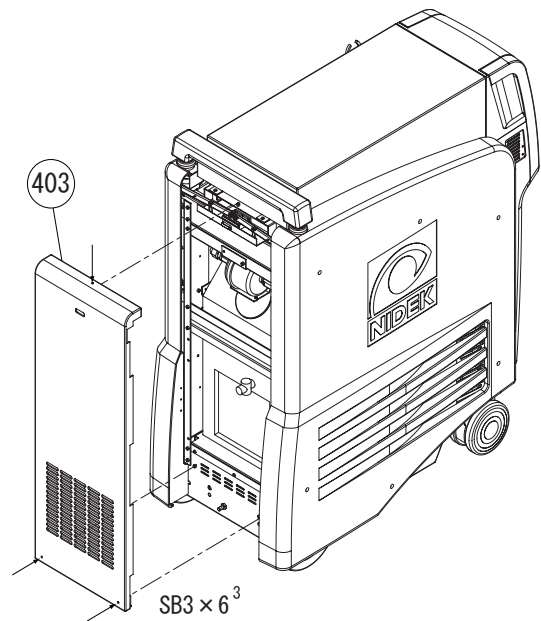
5.1.2 Right cover

1. Remove the screw caps [32906-M091 (n = 6)].
2. Unscrew PC3 × 15 (n = 6) to remove the right cover (17350-M404).
3. Reassemble the parts in reverse order.



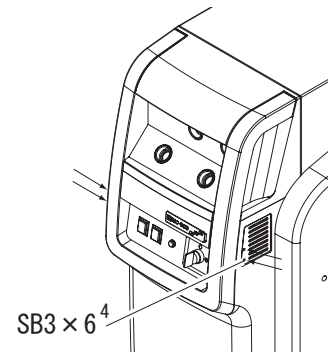
5.1.3 Rear cover

1. Loosen SB3 × 6 (n = 3), pull out the top of the rear cover (17350-M403), and lift the cover to remove it.
2. Reassemble the parts in reverse order.

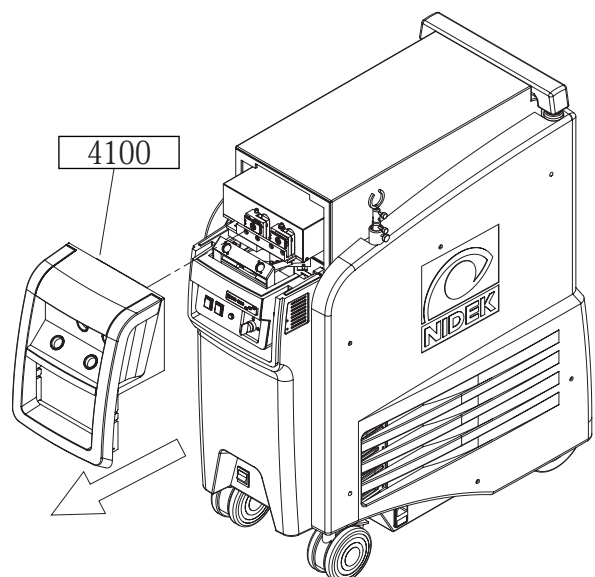


5.1.4 Fiber optic cable cover

1. Loosen SB3 × 6 (n = 4).

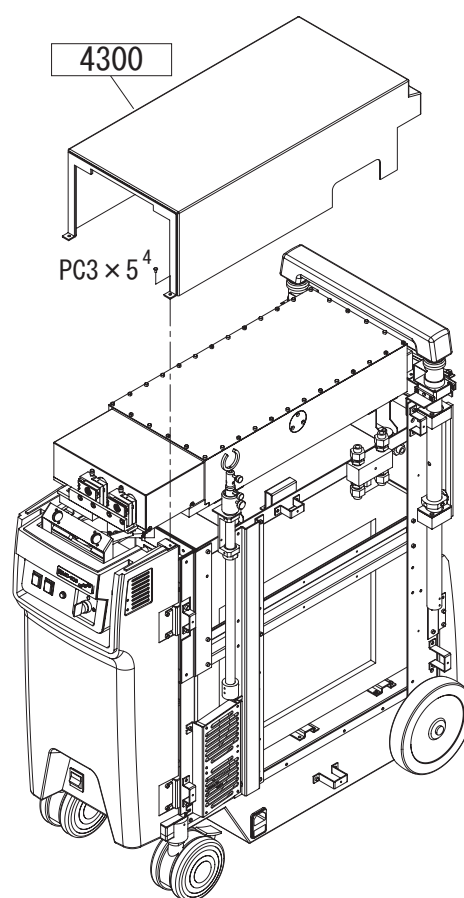


2. Pull off the fiber cover ASSY. (17350-4100) in the direction of the arrow.
3. Reassemble the parts in reverse order.



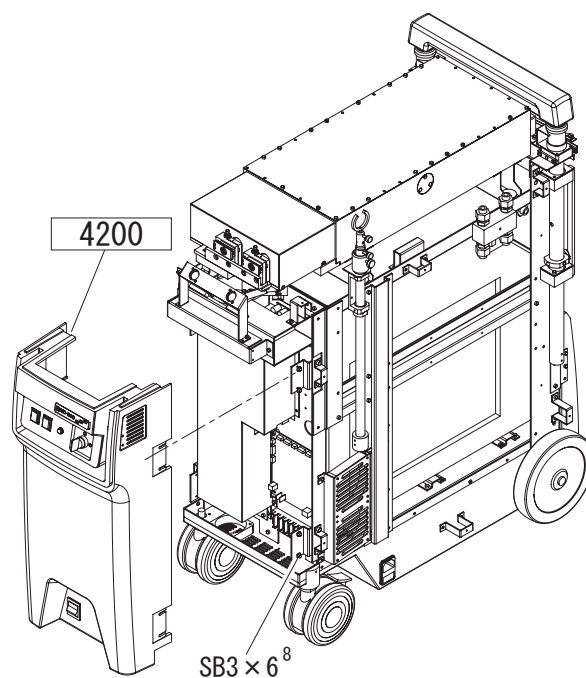
5.1.5 Top cover

1. Remove the fiber optic cable cover (17350-4100) (see 5.1.4).
2. Remove the rear cover (17350-M403) (see 5.1.3).
3. Unscrew PC3 × 5 (n = 4) to remove the top cover ASSY. (17350-4300).
4. Reassemble the parts in reverse order.



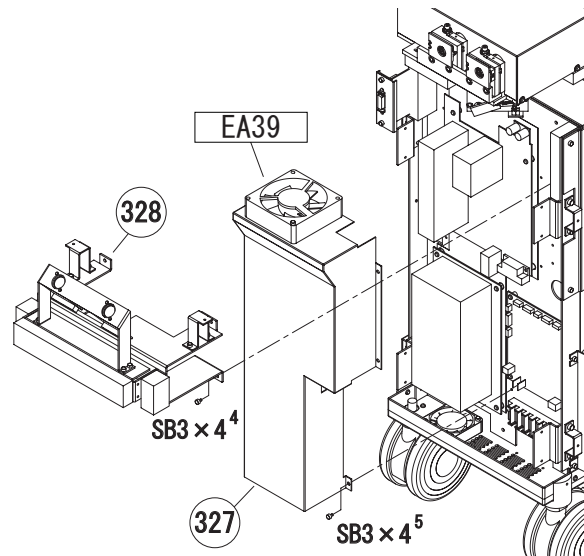
5.1.6 Front cover

1. Remove the fiber optic cable cover (17350-4100) (see 5.1.4).
2. Remove the left cover (17350-M405) (see 5.1.1).
3. Remove the right cover (17350-M404) (see 5.1.2).
4. Loosen SB3 × 6 (n = 8) to remove the front cover ASSY. (17350-4200).
5. Disconnect P301 (J301) and P304 (J304) from the relay board (17350-BA03).
6. Disconnect P30 and P40 from the front panel ASSY. (17350-EA49).
7. Disconnect P601 (J601) from the remote connector board (17740-BA06).
8. Disconnect the connectors from the rocker switch (17350-E008).
9. Reassemble the parts in reverse order.



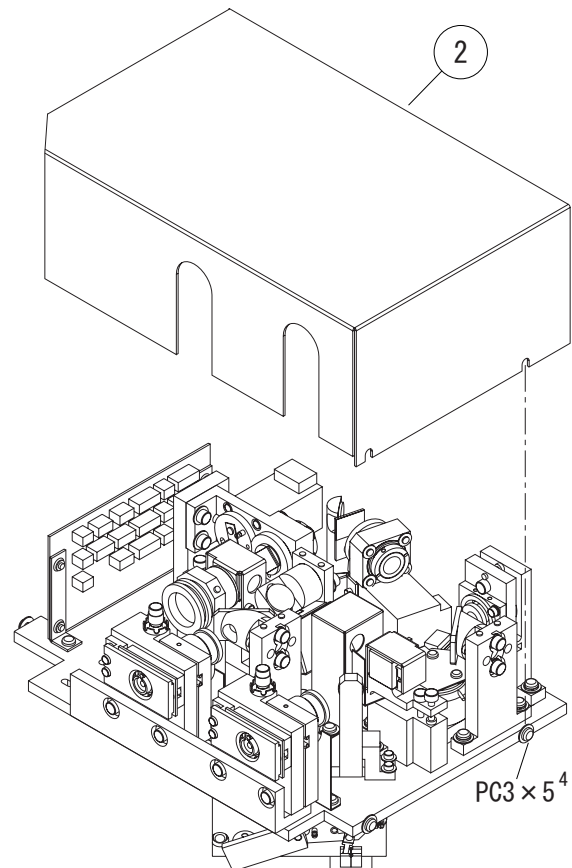
5.2 Duct

1. Remove the covers (see 5.1).
2. Unscrew SB3 × 4 (n = 4) to remove the stay (17350-M328).
3. Disconnect the connector from LD driver fan ASSY. 1 (17350-EA39).
4. Unscrew SB3 × 4 (n = 5) to remove the duct (17350-M327).
5. Reassemble the parts in reverse order.



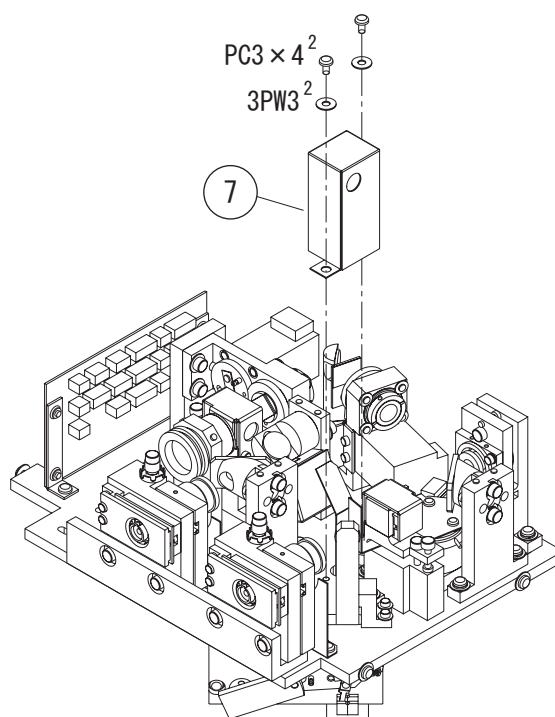
5.3 Shutter ASSY. Cover

1. Remove the covers (see 5.1).
2. Unscrew PC3 × 5 (n = 4) to remove the shutter ASSY. cover (17350-M002).
3. Reassemble the parts in reverse order.



5.4 Coagulation Shutter Cover

1. Remove the shutter ASSY. cover (see 5.3).
2. Unscrew PC3 × 4 (n = 2) and 3PW3 (n = 2) to remove the coagulation shutter cover (17350-M007).
3. Reassemble the parts in reverse order.

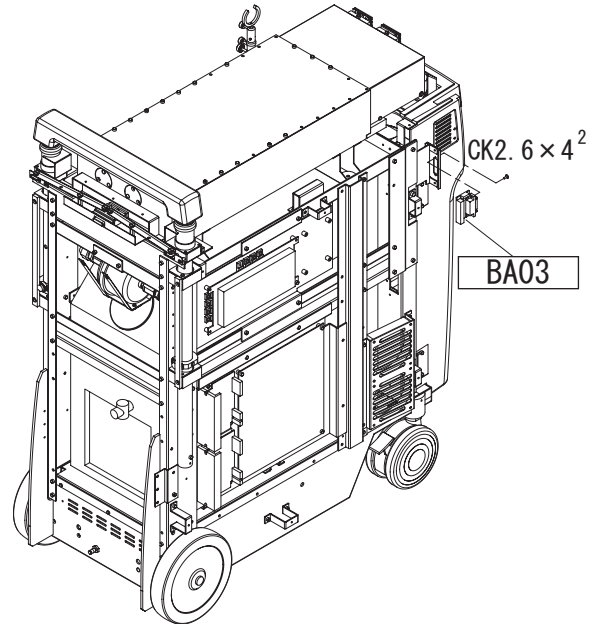


§6 REPLACEMENT PROCEDURES

6.1 Control Box Connector Board

Replacement part: 17310-BA03

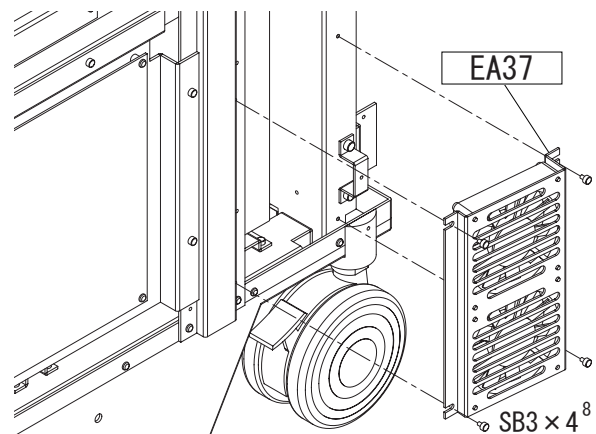
1. Remove the covers (see 5.1).
2. Disconnect P303 (J3) from the control box connector board (17310-BA03).
3. Unscrew CK2.6 × 4 (n = 2) to replace the control box connector board.
4. Reassemble the parts in reverse order.



6.2 Compressor Fan ASSY.

Replacement part: 17350-EA37

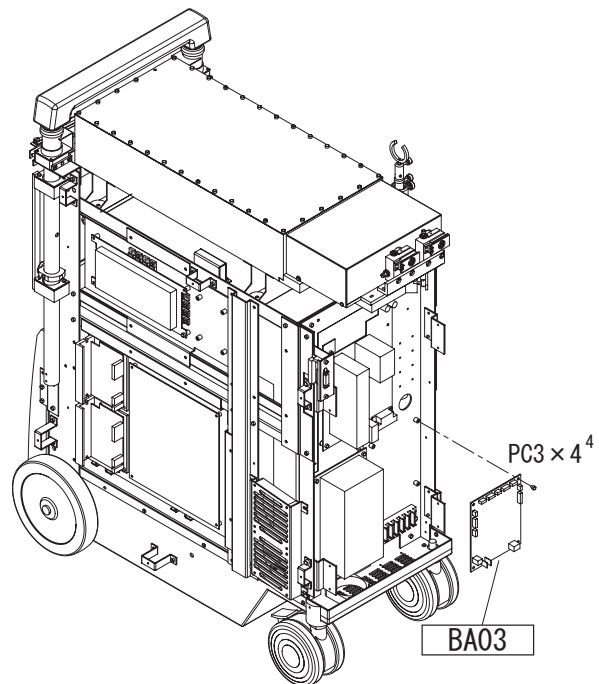
1. Remove the covers (see 5.1).
2. Remove the duct (see 5.2).
3. Disconnect P308 (J308) from the relay board (17350-BA03).
4. Unscrew SB3 × 4 (n = 8) to replace the two compressor fan assemblies (17350-EA37) on the right and left sides of the MC-300.
5. Reassemble the parts in reverse order.



6.3 Relay Board

Replacement part: 17350-BA03

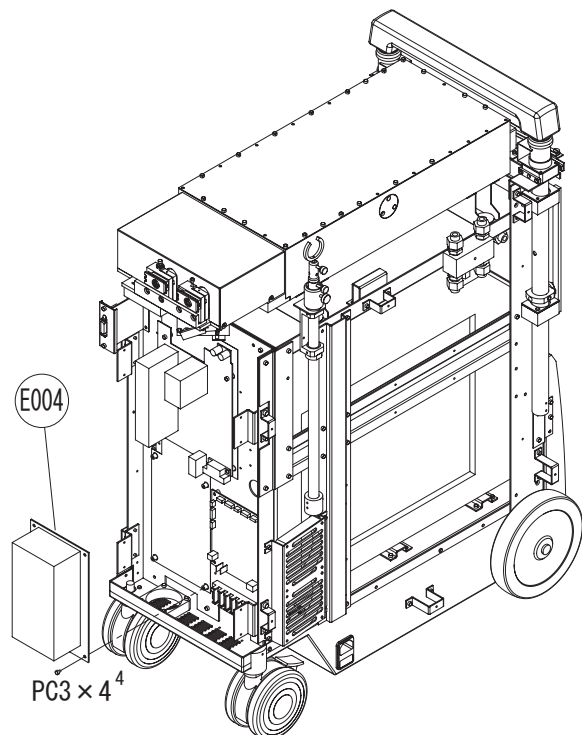
1. Remove the covers (see 5.1).
2. Remove the duct (see 5.2).
3. Disconnect all connectors from the relay board (17350-BA03).
4. Unscrew PC3 × 4 (n = 4) to replace the relay board.
5. Reassemble the parts in reverse order.



6.4 Switching Power Supply

Replacement part: 17350-E004

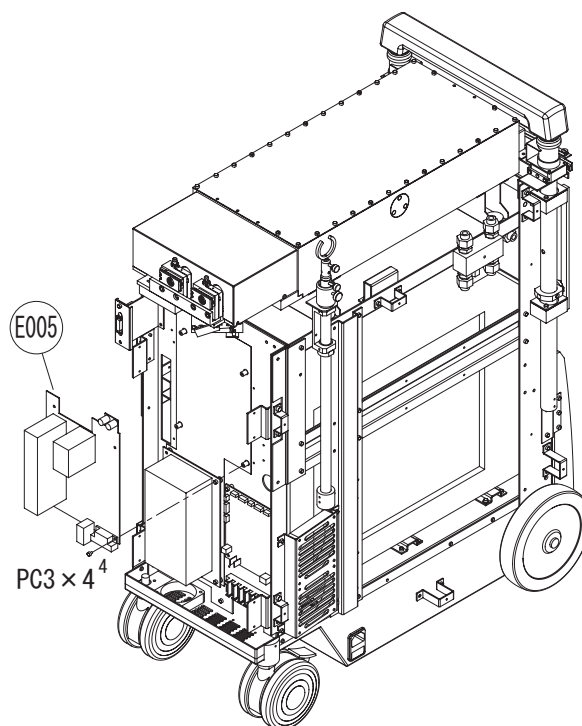
1. Remove the covers (see 5.1).
2. Remove the duct (see 5.2).
3. Disconnect all connectors from the switching power supply (17350-E004).
4. Unscrew PC3 × 4 (n = 4) to replace the switching power supply.
5. Reassemble the parts in reverse order.



6.5 LD Power Supply

Replacement part: 17350-E005

1. Remove the covers (see 5.1).
2. Remove the duct (see 5.2).
3. Disconnect all connectors from the LD power supply (17350-E005).
4. Unscrew PC3 × 4 (n = 4) to replace the LD power supply.
5. Reassemble the parts in reverse order.

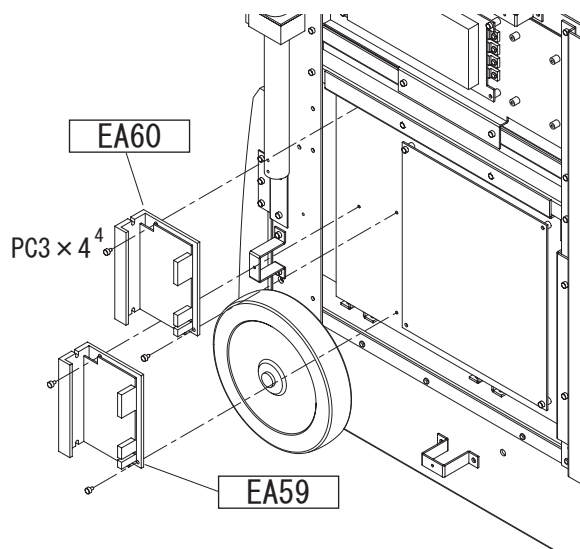


6.6 Motor Driver

6.6.1 C-motor driver ASSY.

Replacement part: 17350-EA59

1. Remove the covers (see 5.1).
2. Disconnect all connectors from the C-motor driver ASSY. (17350-EA59).
3. Unscrew PC3 × 4 (n = 4) to replace the C-motor driver ASSY.
4. Reassemble the parts in reverse order.



6.6.2 A-motor driver ASSY.

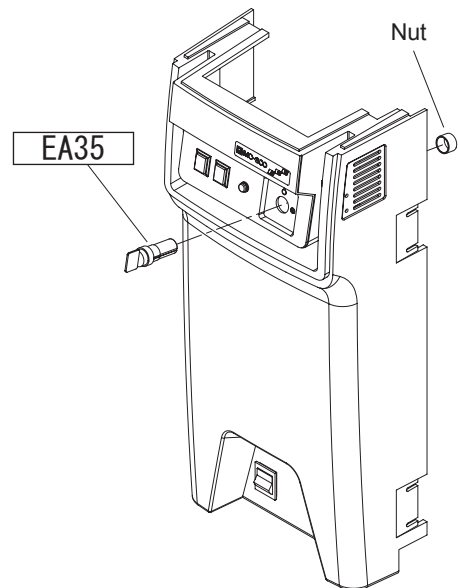
Replacement part: 17350-EA60

1. Remove the covers (see 5.1).
2. Disconnect all connectors from the A-motor driver ASSY. (17350-EA60).
3. Unscrew PC3 × 4 (n = 4) to replace the A-motor driver ASSY. (see 6.6.1).
4. Reassemble the parts in reverse order.

6.7 Key Switch ASSY.

Replacement part: 17350-EA35

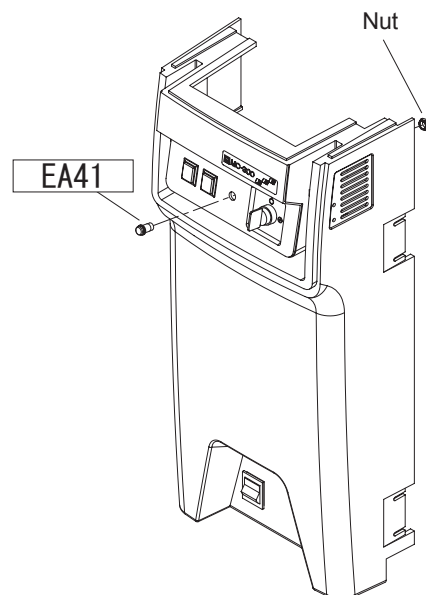
1. Remove the front cover (see 5.1.6).
2. Remove the nut to replace the key switch ASSY. (17350-EA35).
3. Reassemble the parts in reverse order.



6.8 Line Indicator ASSY.

Replacement part number: 17350-EA41

1. Remove the front cover (see 5.1.6).
2. Remove the nut to replace the line indicator ASSY. (17350-EA41).
3. Reassemble the parts in reverse order.

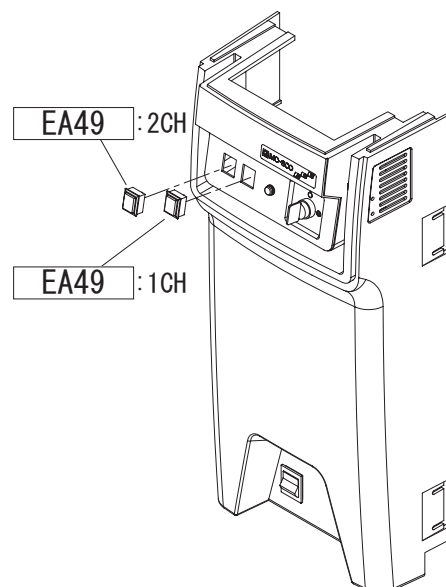


6.9 Front Panel ASSY.

Replacement part: 17350-EA49

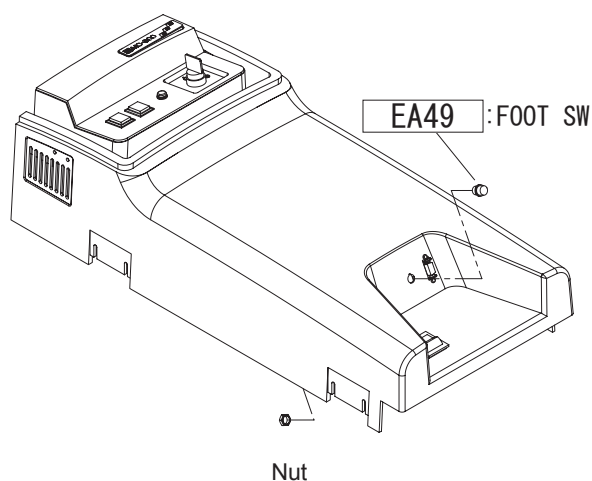
6.9.1 Channel switch

1. Remove the front cover (see 5.1.6).
2. Remove the crimp pin from P40 on the front panel ASSY. (17350-EA49).
3. Replace the two channel switches of the front panel ASSY.
4. Reassemble the parts in reverse order.



6.9.2 Foot switch connector

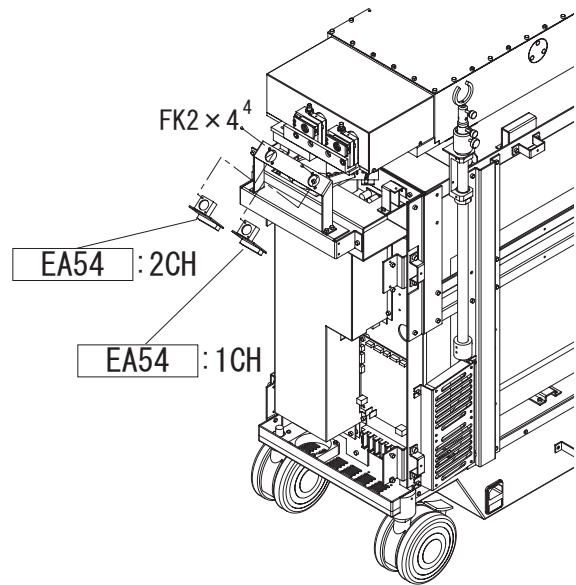
1. Remove the front cover (see 5.1.6).
2. Remove the crimp pin from P30 on the front panel ASSY. (17350-EA49).
3. Replace the foot switch connector on the front panel ASSY.
4. Reassemble the parts in reverse order.



6.10 Delivery Unit ASSY.

Replacement part: 17350-EA54

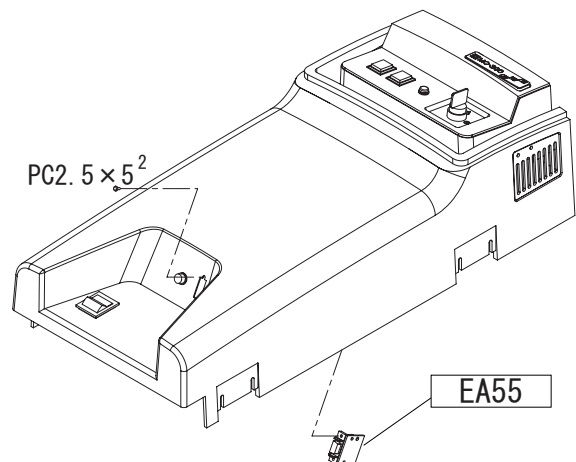
1. Remove the front cover (see 5.1.6).
2. Remove the ground wire from the delivery unit ASSY. (17350-EA54).
3. Unscrew FK2 × 4 (n = 4) to remove the delivery unit ASSY.
4. Remove the flexible flat cable (17350-E521) from J701 on the connector board (17621-E4965). Replace the delivery unit ASSY.
5. Reassemble the parts in reverse order.



6.11 Remote Connector ASSY.

Replacement part: 17350-EA55

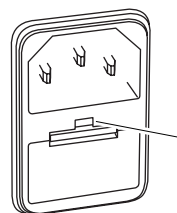
1. Remove the front cover (see 5.1.6).
2. Remove the ground wire from the remote connector ASSY. (17350-EA55).
3. Disconnect P601 (J601) from the remote connector board (17740-BA06).
4. Unscrew PC2.5 × 5 (n = 2) to replace the remote connector ASSY.
5. Reassemble the parts in reverse order.



6.12 Fuses

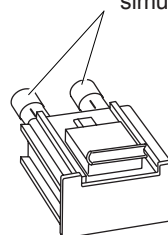
Replacement parts: 80402-02060 (100 V area)
80402-02043 (200 V area)

1. Turn the master switch off.
2. Disconnect the power cord from the main body inlet and wall outlet.
3. Insert a flatblade screwdriver into the notch in the fuse holder. Then pry the screwdriver down. The fuse carrier will pop out.
4. Replace the fuses.
5. Reassemble the parts in reverse order.



Insert the precision screwdriver (flatblade) here and pry it. Then the fuse carrier will pop out.

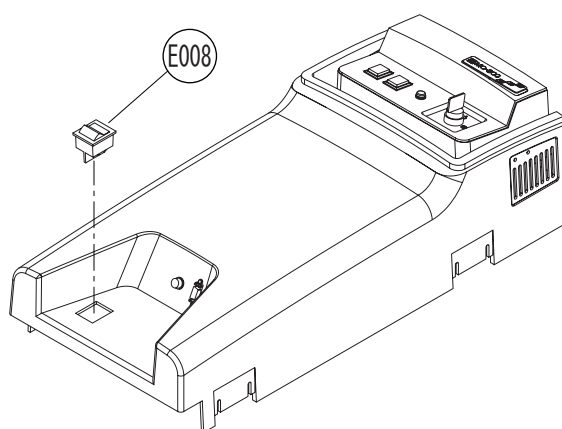
Replace the two fuses simultaneously.



6.13 Master Switch

Replacement part: 17350-E008

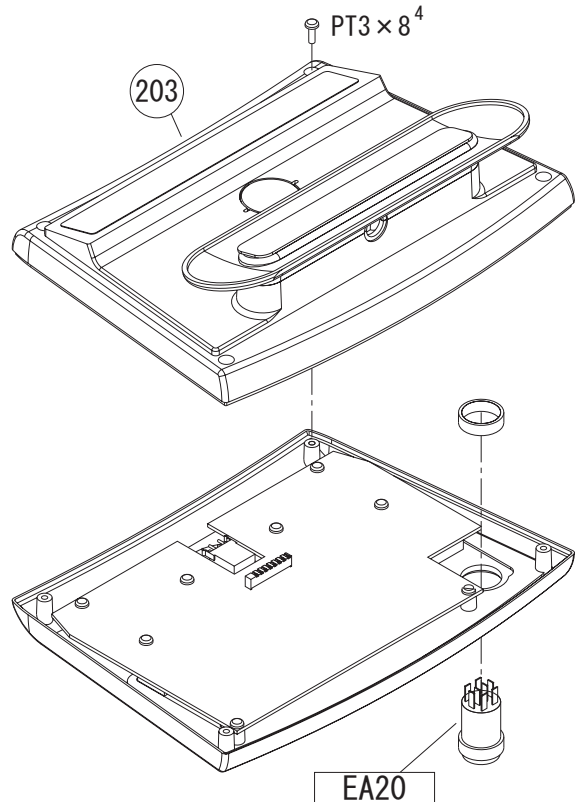
1. Remove the covers (see 5.1).
2. Replace the master switch (17350-E008).
3. Reassemble the parts in reverse order.



6.14 Emergency Switch ASSY.

Replacement part: 17350-EA20

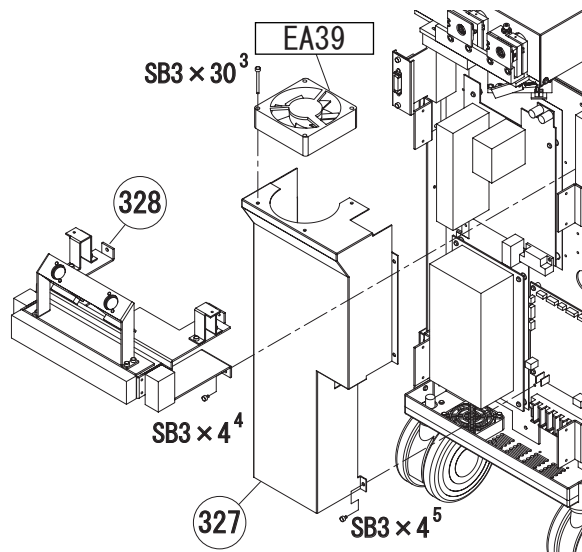
1. Remove the control box from the main body (17350-2000).
2. Unscrew PT3 × 8 (n = 4) to remove the lower box (17310-M203).
3. Disconnect the connectors of the emergency switch ASSY. (17350-EA20) from the control box cable ASSY. (17350-EA22).
4. Remove the nut to replace the emergency switch ASSY.
5. Reassemble the parts in reverse order.



6.15 LD Driver Fan ASSY. 1

Replacement part: 17350-EA39

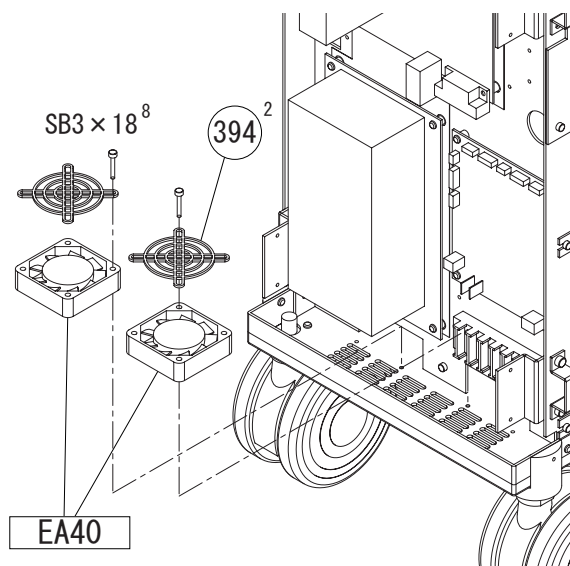
1. Remove the covers (see 5.1).
2. Remove the duct (see 5.2).
3. Disconnect the connector from the LD driver (17350-E005).
4. Unscrew SB3 × 30 (n = 3) to replace LD driver fan ASSY. 1 (17350-EA39).
5. Reassemble the parts in reverse order.



6.16 LD Driver Fan ASSY. 2

Replacement part: 17350-EA40

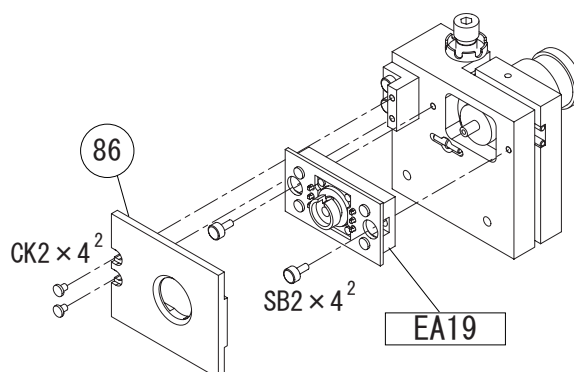
1. Remove the covers (see 5.1).
2. Remove the duct (see 5.2).
3. Disconnect P309 (J309) from the master board (17350-BA01).
4. Unscrew SB3 × 18 (n = 8) to replace LD driver fan ASSY. 2 (17350-EA40).
5. Reassemble the parts in reverse order.



6.17 Fiber Switch ASSY.

Replacement part: 17350-EA19

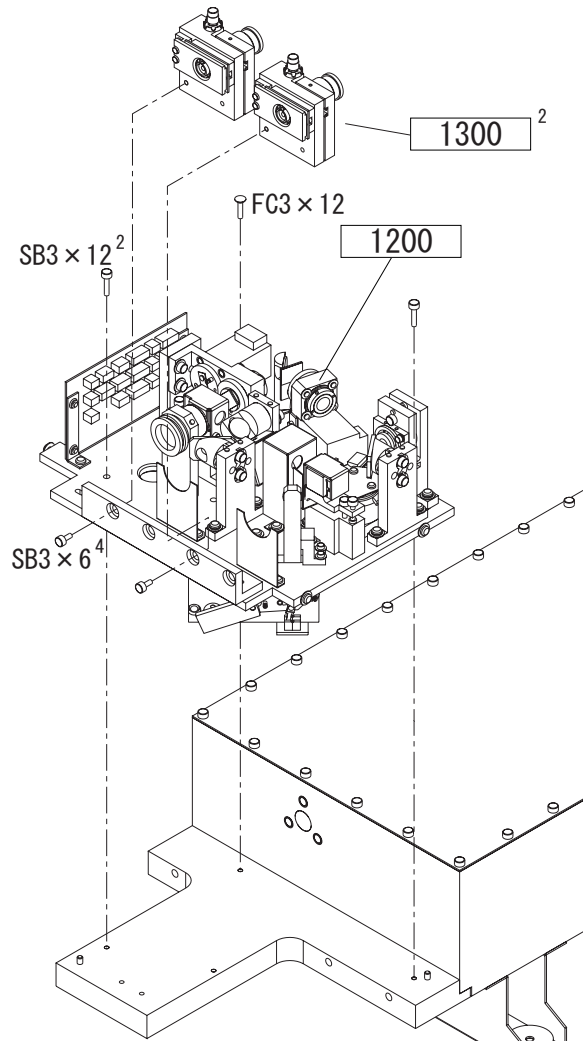
1. Remove the covers (see 5.1).
2. Remove the shutter cover (see 5.3).
3. Unscrew CK2 × 4 (n = 2) to remove the cover (17350-M086).
4. Disconnect P212 (J212) on the CH1 side and P213 (J213) on the CH2 side from the interface board (17350-BA02).
5. Unscrew SB2 × 4 (n = 2) to replace the fiber switch ASSY. (17350-EA19).
6. Reassemble the parts in reverse order.



6.18 Shutter ASSY. (Dual)

Replacement part: 17350-1200

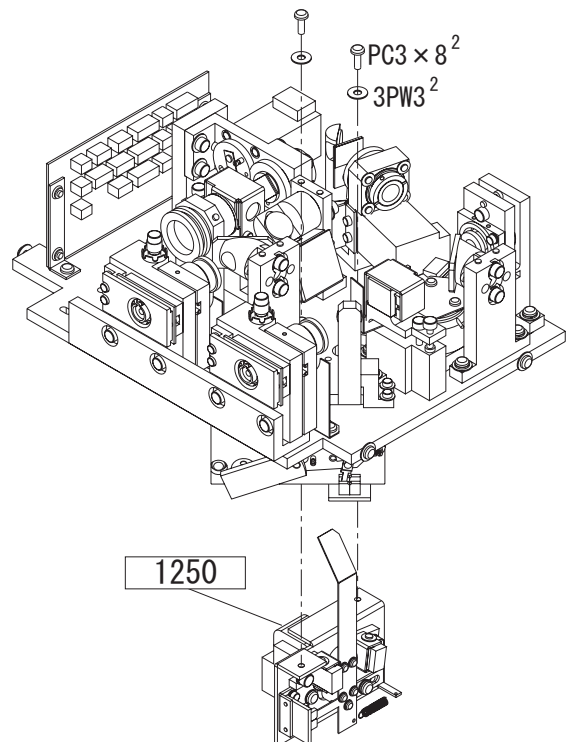
1. Remove the covers (see 5.1).
2. Remove the shutter cover (see 5.3).
3. Disconnect P201 (J201), P212 (J212), P213 (J213), and P215 (J215) from the interface board (17350-BA02).
4. Unscrew SB3 × 6 (n = 4) to remove the collector optics ASSYs [17350-1300 (n = 2)].
5. Unscrew SB3 × 12 (n = 2) and FC3 × 12 to replace the shutter ASSY. (dual) (17350-1200).
6. Reassemble the parts in reverse order.
7. Adjust the collector optics.



6.19 Coagulation Shutter ASSY.

Replacement part: 17350-1250

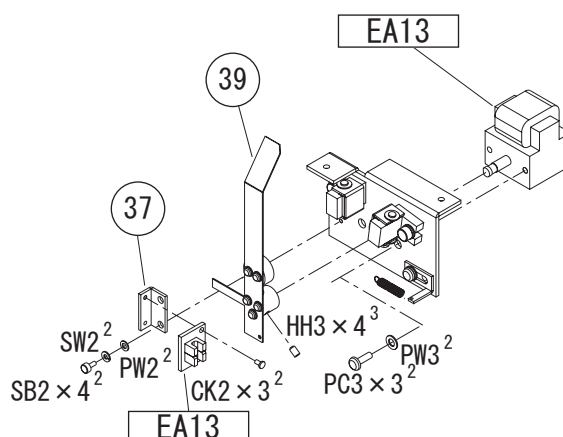
1. Remove the coagulation shutter cover (see 5.4).
2. Remove the shutter ASSY. (dual) (see 6.18).
3. Disconnect P204 (J204) and P205 (J205) from the interface board (17350-BA02).
4. Unscrew PC3 × 8 (n = 2) and 3PW3 (n = 2) to replace the coagulation shutter ASSY. (17350-1250).
5. Reassemble the parts in reverse order.
6. Adjust the position of the coagulation shutter ASSY.



6.20 Sensor and Solenoid of Coagulation Shutter ASSY.

Replacement part: 17350-EA13

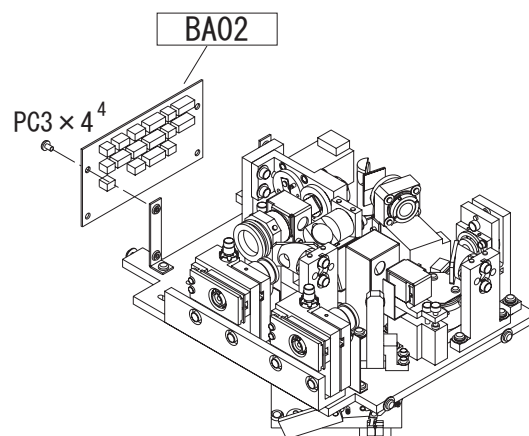
1. Remove the shutter ASSY. (dual) (see 6.18).
2. Unscrew SB2 × 4 (n = 2), SW2 (n = 2), and PW2 (n = 2) to remove the sensor of the coagulation shutter ASSY. (17350-EA13) together with the sensor support (17350-M037).
3. Loosen HH3 × 4 (n = 3) to remove the coagulation shutter plate (17350-M039).
4. Unscrew PC3 × 3 (n = 2) and PW3 (n = 2) to remove the solenoid of the coagulation shutter ASSY.
5. Reassemble the parts in reverse order.



6.21 Interface Board

Replacement part: 17350-BA02

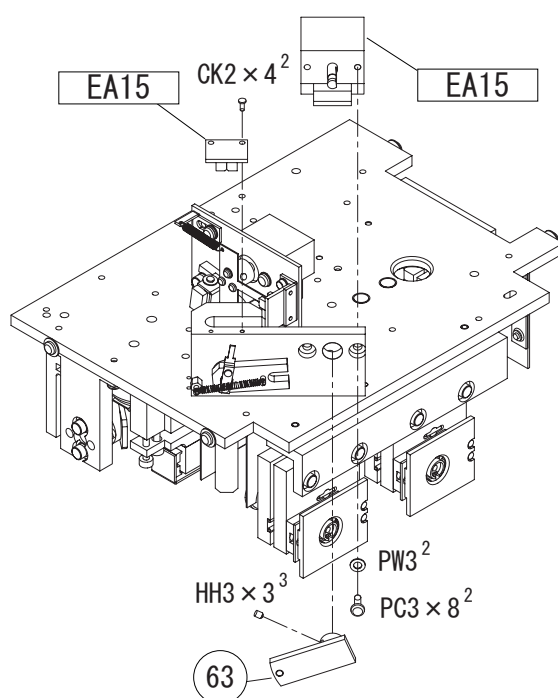
1. Remove the covers (see 5.1).
2. Disconnect all connectors from the interface board (17350-BA02).
3. Unscrew PC3 × 4 (n = 4) to replace the interface board.
4. Reassemble the parts in reverse order.



6.22 Dual Shutter ASSY.

Replacement part: 17350-EA15

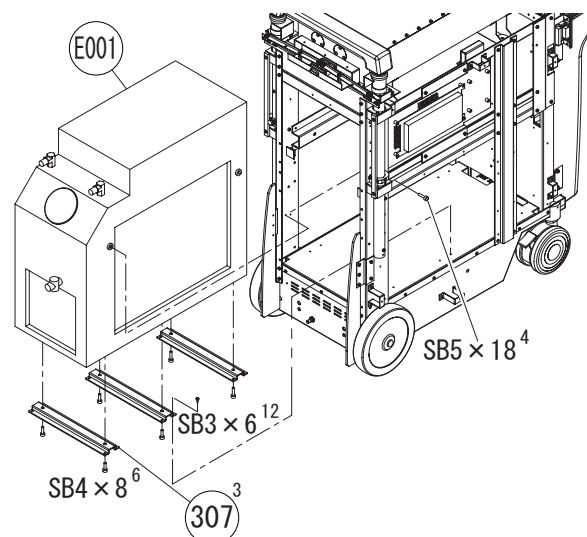
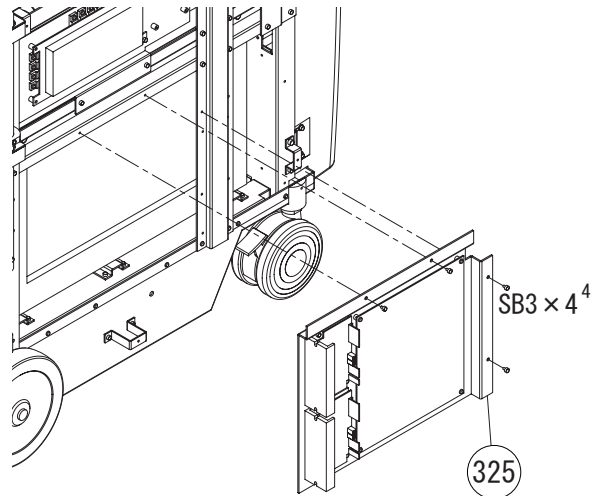
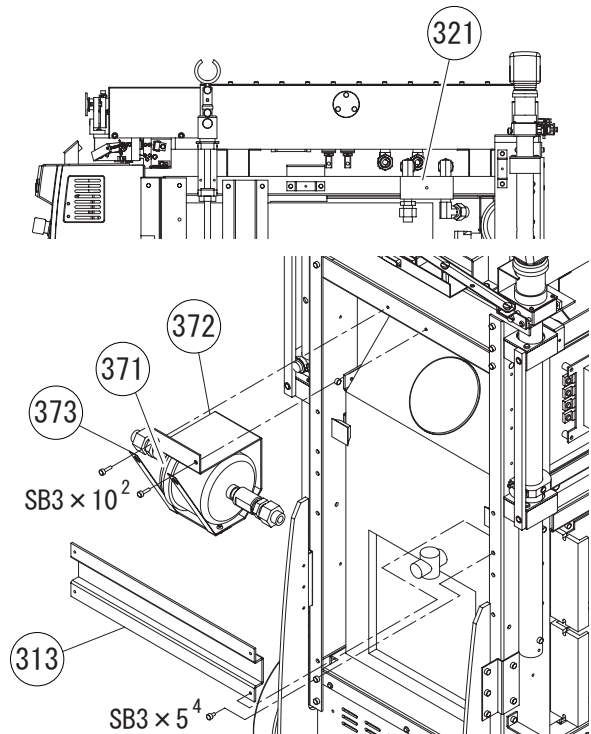
1. Remove the shutter ASSY. (dual) (see 6.18).
2. Disconnect P208 (J208) and P209 (J209) from the interface board (17350-BA02).
3. Unscrew CK2 × 4 (n = 2) to remove the sensor of the dual shutter ASSY. (17350-EA15).
4. Unscrew PC3 × 8 (n = 2) and PW3 (n = 2) to remove the solenoid of the dual shutter ASSY. Replace the dual shutter ASSY.
5. Reassemble the parts in reverse order.



6.23 Cooling Device

Replacement part: 17350-E001

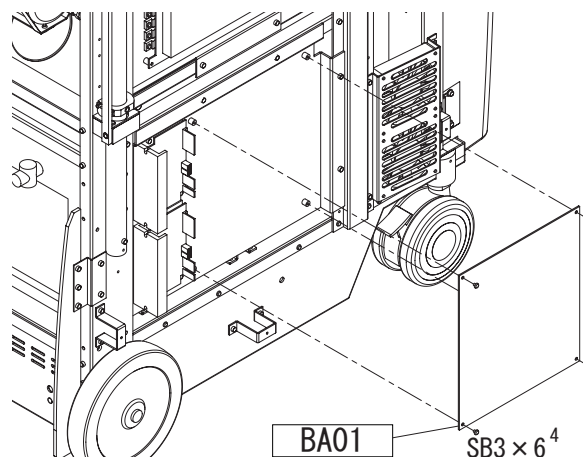
1. Remove the covers (see 5.1).
2. Open the cock of the cooling device (17350-E001) to drain the cooling water.
* Prepare a bucket and cloth.
3. Remove the hose under the relay block (17350-M321) on the right side when viewed from the front.
* Be careful no to let the main body exposed to the cooling water.
4. Disconnect P903 (J903) and P904 (J904) from the cooling device.
5. Unscrew SB3 × 10 (n = 2) to draw out the filter (17350-M371), filter attachment plate (17350-M372), and filter fixing plate (17350-M373) toward the rear.
6. Unscrew SB3 × 5 (n = 4) to remove relay plate 2 (17350-M313).
7. Remove the compressor fan ASSY. (17350-EA37) (see 6.2).
8. Unscrew SB3 × 4 (n = 4) to lift board attachment plate 3 (17350-M325) together with the master board (17350-BA01).
9. Unscrew SB5 × 18 (n = 4) and SB3 × 8 (n = 12) to draw out the cooling device toward the rear by about 5 cm.
10. Remove the compressor input ASSY. (17350-EA43) from the terminal block of the cooling device.
11. Pull out the cooling device toward the rear.
12. Remove the hose from the cooling device.
13. Unscrew SB4 × 8 (n = 6) to remove attachment plate 1 [17350-M307 (n = 3)] from the cooling device. Replace the cooling device.
14. Reassemble the parts in reverse order.
15. Supply pure water and set the flow amount (see 7.7).
16. Set the water temperature (see 7.8).



6.24 Master Board

Replacement part: 17350-BA01

1. Remove the covers (see 5.1).
2. Disconnect all connectors from the master board (17350-BA01).
3. Unscrew PC3 × 6 (n = 4) to remove the master board.
4. Remove the EEPROM (IC8) on the master board.
5. Mount the removed EEPROM onto a new master board.
6. Reassemble the parts in reverse order.
7. Position the VRs on the new master board almost as same as those on the old one.
8. Turn VR3, VR4, and VR5 fully clockwise.
9. Adjust the laser power output (see 7.10).
10. Adjust the monitor (see 7.11).
11. Adjust the current signal (see 7.12).
12. Adjust the overpower and underpower (see 7.13).

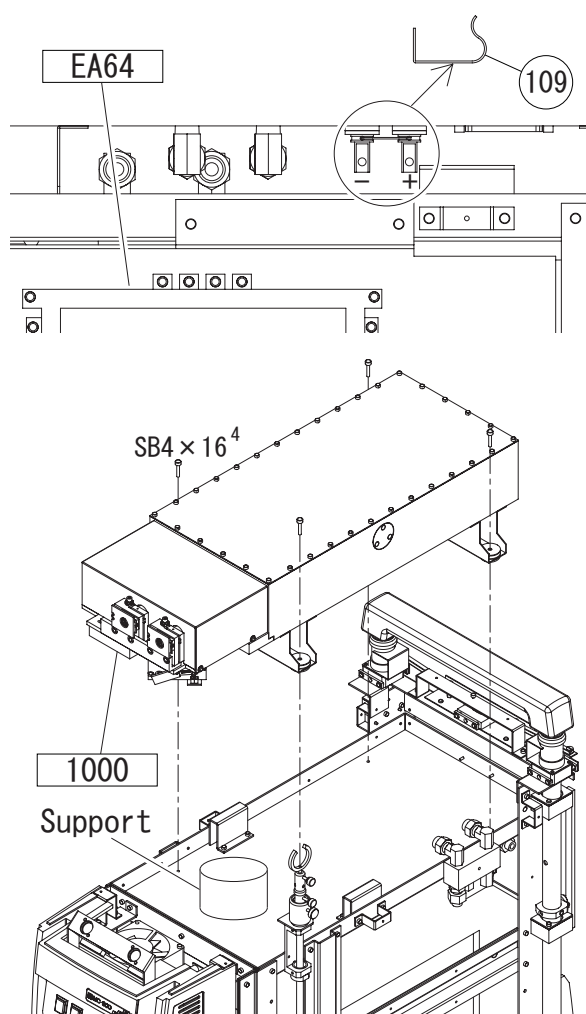


6.25 Laser Unit

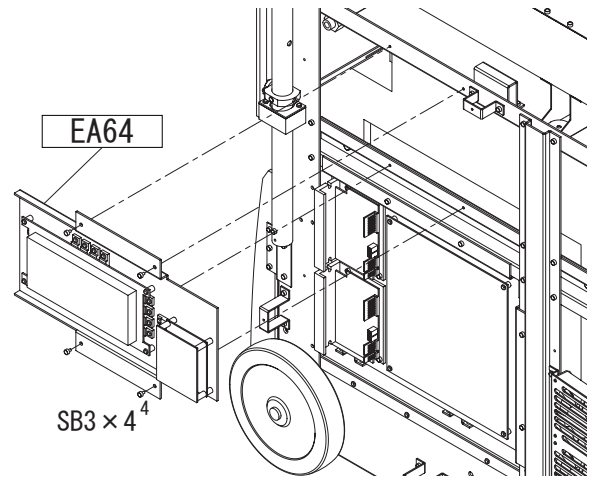
Replacement part: 17350-1000

* Take antistatic precautions prior to work.

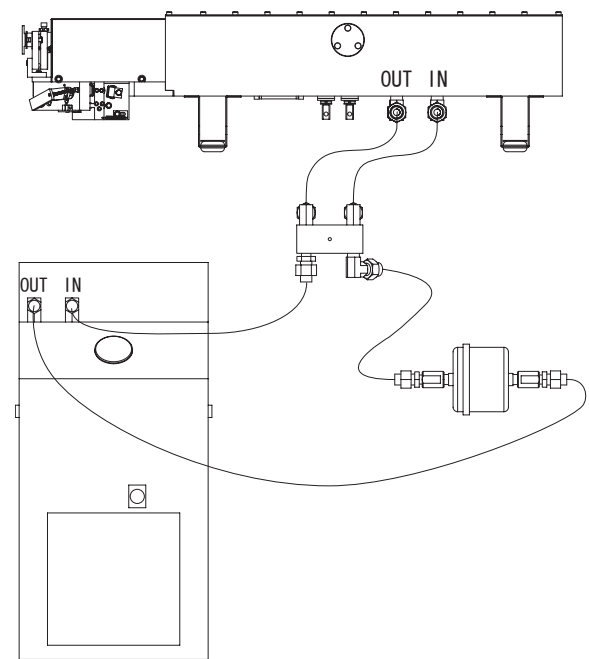
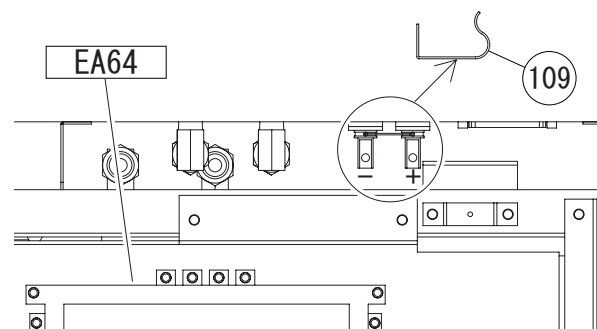
1. Remove the covers (see 5.1).
2. Mount the short pin (17350-M109) on the electrode of the laser unit (17350-1000).
3. Unscrew SB5 × 12 (n = 2), SW5 (n = 2), and PW5 (n = 2) to remove the laser head power supply cable ASSY. (17350-EA61) from the laser unit.
4. Disconnect P201 and P215 on the interface board (17350-BA02).
5. Open the cock of the cooling device (17350-E001) to drain the cooling water.
6. Unscrew SB4 × 16 (n = 4) to lift the laser unit and remove the hose from the laser unit.
 - * Put the laser unit on a support for easy removal.
 - * Be careful not to let the main body exposed to the cooling water.
7. Disconnect P906 from the laser unit to replace the laser unit.



8. Remove 3 ch temperature control board (17350-E006) and disconnect all connectors on the Peltier driver (17350-E900).
9. Unscrew SB3 × 4 (n = 4) to remove the Peltier driver (17350-EA64).
10. Remove the master board (17350-BA01) (see 6.24).



11. Reassemble the parts in reverse order.
 - * Viewed from the Peltier driver, wire the red wire of the laser head power supply cable ASSY. (17350-EA61) to the plus side and the white one to the minus side (see the right figure).
 - * Do not disconnect the short pin until the laser head power supply cable ASSY. is mounted.
 - * Fix the removed short pin to the console (17350-3000) with tape so as not to lose it.
 - * Connect the hose as shown in the right figure.

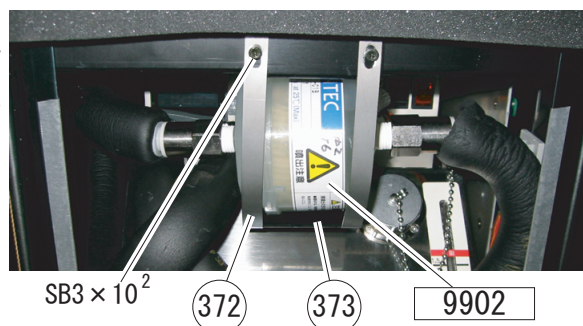


6.26 Water Filter

6.26.1 New type of water filter

Replacement part: 17350-9902

1. Remove the covers (see 5.1).
2. Unscrew SB3 × 10 (n = 2) to remove the water filter ASSY. (17350-9902), filter attachment plate (17350-M372), and filter fixing plate (17350-M373) from the frame of the main body.

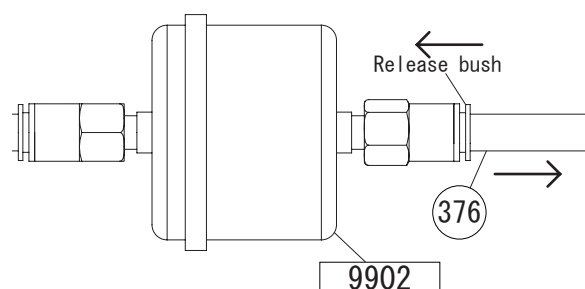


3. Remove the filter attachment plate and filter fixing plate from the water filter ASSY.



4. Pull out the tube (17350-M376) while pushing the release bush in the arrow direction.

- * The tube is fixed tightly to the joint.
- * Pull out the tube slowly.
- * After removing the hose, drain any water remaining inside the hose into a prepared bucket. Then, fix the hose pointing upward with tape.



5. Pull out the other tube (17350-M376) in the same manner.

6. Replace the water filter ASSY. (17350-9902).

- * The cooling water remained in the water filter ASSY. or tube may spill. In case, put the bucket under the replacement. Should the water spill, immediately wipe it with a cloth.

7. Reassemble the parts in reverse order.

- * Insert the tube by about 22 mm into the joint.
- * Mark about 22 mm position from the hose end with a felt pen in advance.

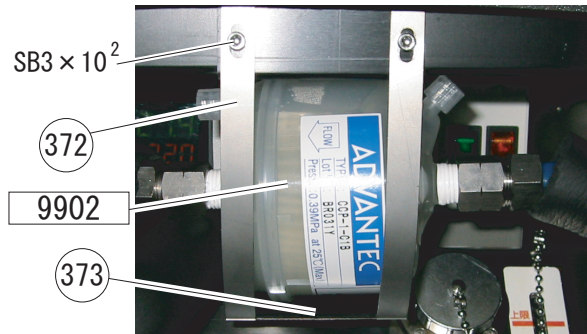
8. Supply the cooling water (see 7.7).

9. Prepare to start the MC-300, turn the main switch on, and check the water does not leak from the hose connection.

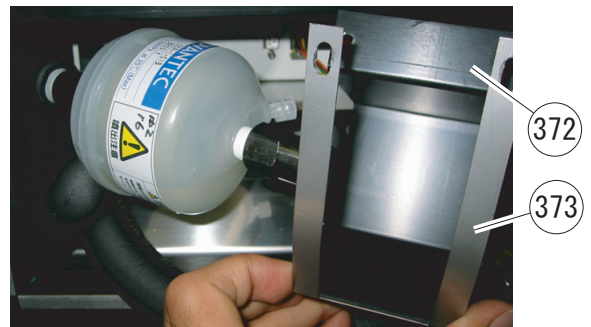
6.26.2 Old type of water filter

Replacement par: 17350-9902
17350-9904

1. Remove the covers (see 5.1).
2. Unscrew SB3 × 10 (n = 2) to remove the old type of water filter ASSY. (17350-9902), filter attachment plate (17350-M372), and filter fixing plate (17350-M373) from the frame of the main body.

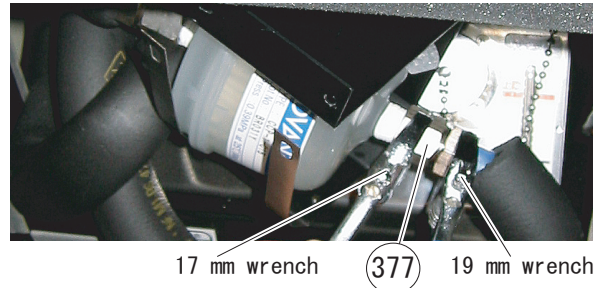


3. Remove the filter attachment plate and filter fixing plate from the old type of water filter ASSY.



4. Remove the old type of water filter following the procedures below.

- 1) Tighten the hexagonal body of the tube joint (17350-M377) with a 17 mm wrench and loosen the hexagonal nut with a 19 mm wrench.
- 2) After the hexagonal nut is loosened to some extent, finally loosen and remove it by hand.



- 3) Pull out the tube (17350-M376) slowly.

* After removing the hose, drain any water remaining inside the hose into a prepared bucket. Then, fix the hose pointing upward with tape.

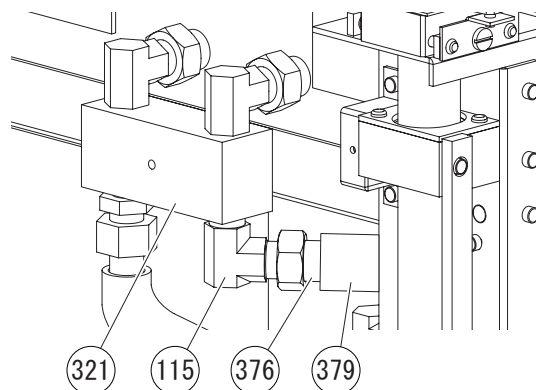
- 4) Pull out the other tube (17350-M376) in the same manner and replace the old type of water filter ASSY.

* The cooling water remained in the water filter ASSY. or tube may spill. In case, put the bucket under the replacement. Should the water spill, immediately wipe it with a cloth.

5. Unscrew the hexagonal nut of the elbow union (17350-M115) mounted on the relay block (17350-M321), and remove the heat-insulated tube (17350-M379) along with the tube (17350-M376) and sleeve (17350-M606).

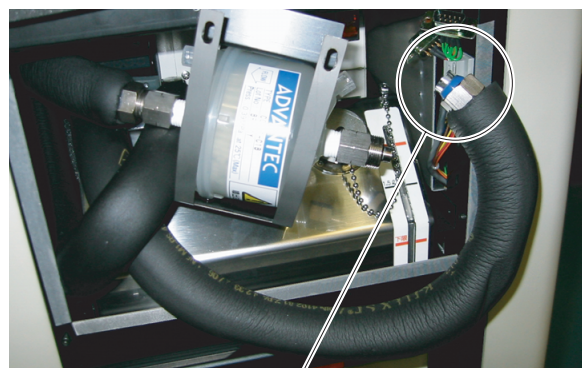
6. Unscrew the attached hexagonal nut of the elbow union and remove the heat-insulated tube from the tube.

* When the sleeve is hard to remove, pinching the end of the tube with a nipper will help.



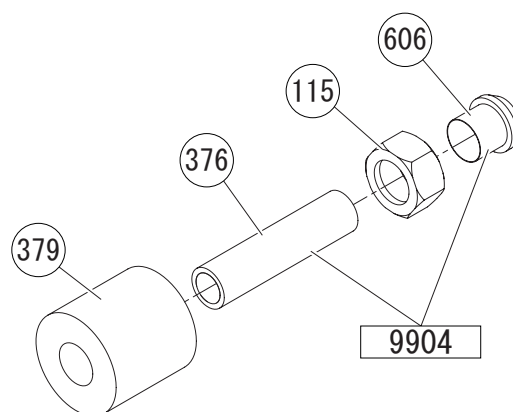
7. Unscrew the hexagonal nut attached to the tube on the inlet side of the water filter and remove the sleeve. Then cut off the tube by about 1 cm from its end.

* When the sleeve is hard to remove, pinching the end of the tube with a nipper will help.



Inlet side tube

8. Mount the attached hexagonal nut of the elbow union and heat-insulated tube which were removed in Step 6 to the tube and sleeve of the replacement hose (17350-9904).
9. Mount the replacement hose to the elbow union attached on the relay block.

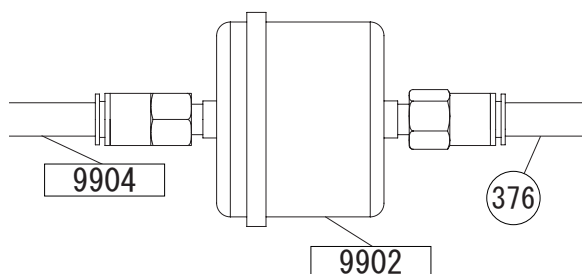


10. Attach a new type of water filter (17350-9902) following the procedures below.

- 1) Insert the tube of the replacement hose into the outlet side of the water filter.
- 2) Insert the tube into the inlet side of the water filter.

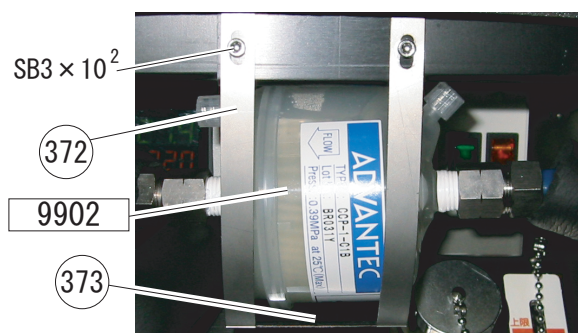
* Insert the tube by about 22 mm into the joint.

* Mark about 22 mm position from the hose end with a felt pen in advance.



- 3) Mount the filter attachment plate and filter fixing plate to the water filter. Then mount the water filter ASSY., filter attachment plate, and filter fixing plate to the frame of the main body with SB3 × 10 (n = 2).

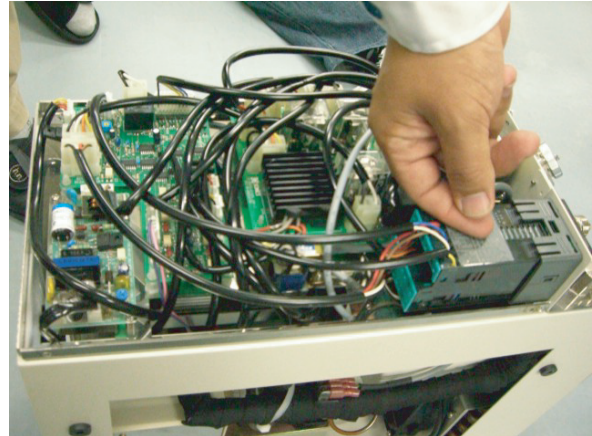
11. Supply the cooling water (see 7.7).
12. Prepare to start the MC-300, turn the main switch on, and check the water does not leak from the hose connection.



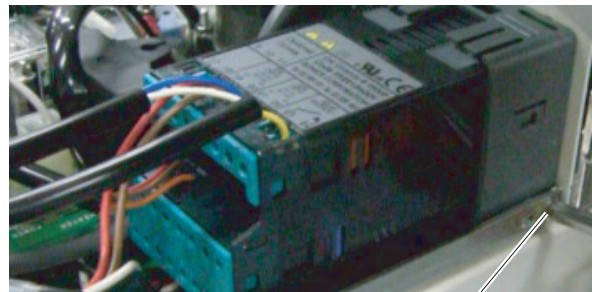
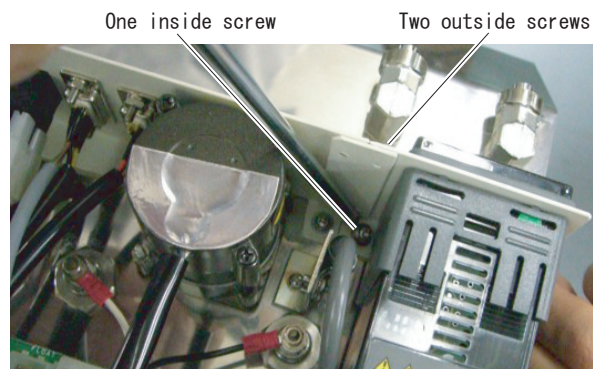
6.27 Controller of Cooling Device

Replacement part: 17350-9903

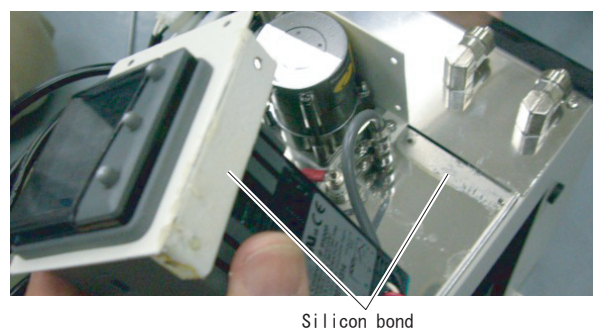
- 1.Remove the cooling device (17350-E001) (see 6.23).
- 2.Remove the top cover of the cooling device.



3. Loosen two outside screws, one inside screw, and one side screw to remove the controller along with the white sheet metal component on which the controller is attached.



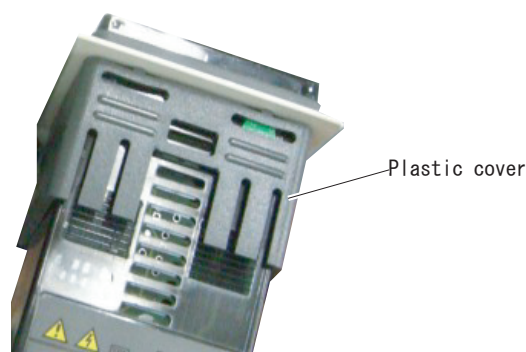
- * When the controller is adhered with silicon bond, remove it while peeling off with a flatblade screwdriver.



4. Remove the wire rod which is wired in the controller.
5. Remove the plastic cover fixing the controller while releasing the clasps of the cover with a small flatblade screwdriver.

* The plastic cover is divided into two.

6. Remove the white sheet metal from the controller.



7. Remove the IC (18 pin DIP) from the IC socket on the board in the upper portion of the cooling device, and attach the IC for the cooling device [17350-E601 (Version 1.5 or later)].
8. Attach the controller (17350-E600) in reverse order.

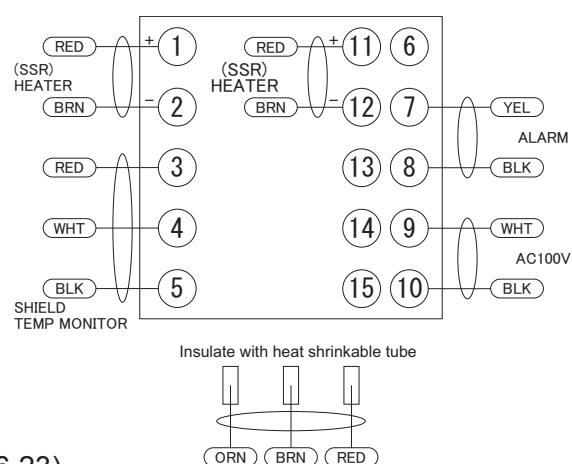
- 1) Attach a white plastic component to the controller to fix it.

* Be sure to remove the screws on the white plastic component.

- 2) Wire the controller as shown in the right figure.

* Clamp the wires with the screws.

- 3) The wires connected to terminals 9, 10, and 11 on the old controller are not used, so insulate them with heat-shrinkable tube.



9. Attach the cooling device (17350-E001) (see 6.23).
10. Supply pure water and set the water flow amount (see 7.7).
11. Set the water temperature (see 7.8).

§ 7 ADJUSTMENT

7.1 Master Board Check

1. Measure the resistance value with a digital tester (resistance range). Perform measurement while all connectors are connected.

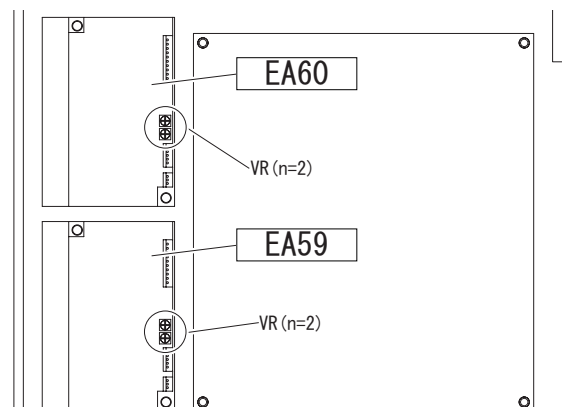
Red probe	Black probe	Resistance (Ω)
IC8 (EEPROM) : 8th pin	BA01 D.GND	Not short
TR4: 5th pin	BA01 D.GND	Not short
J102: 4th pin	BA01 D.GND	Not short
J102: 3rd pin	BA01 D.GND	Not short
J128: 1st pin	BA01 D.GND	Not short

7.2 Relay Board Check

1. Disconnect P312 and P313 from the relay board (17350-BA03).
2. Insulate every terminal of four cables connected to the laser unit (17350-1000) with four terminal caps (80423-40014).
3. Connect the power cord into the power outlet, turn the master switch on, and check that the LINE indicator lights up.
4. With a digital tester (DCV range), check that the voltage of each connector on the master board (17350-BA01) is as follows:
 - 1) Between the P124 1st pin and D_GND: DC +5 $\pm$ 0.2 V
 - 2) Between the P124 6th pin and D_GND: DC +24 $\pm$ 1 V
 - 3) Between the P124 7th pin and D_GND: DC -15 $\pm$ 0.5 V
 - 4) Between the P124 9th pin and D_GND: DC +15 $\pm$ 0.5 V
5. Turn the main switch off.
6. Connect the control box (CB: 17350-2000).
7. Turn the main switch on.
8. With the digital tester (ACV range), check that the voltage between the J312 1st and 3rd pins on the relay board (17350-BA03) is AC 100 $\pm$ 15 V.
9. Check that two fans under the relay board and four fans for the cooling device, two each in the right and left, are rotating.
10. Peel off the RY3 protective film on the relay board, turn the variable resistor (VR) in 1.5 increments (3 minutes), affix the film again.
11. Mount the front cover ASSY. (17350-4200).

7.3 Pulse Motor Driver

1. Turn the four VRs on the C-motor driver ASSY. (17350-EA59) and A-motor driver ASSY. (17350-EA60) with a Phillips screwdriver to 9.



7.4 EEPROM Initial Setting

1. Make a record of all parameter settings.
2. Set DIP SW 1 to 6 on the control box (17350-2000) to the OFF position.
3. Turn the main switch on.
4. Turn the key switch to the ON position.
5. Select either of the following parameters with the TIME switches on the control box.
 - 1) Ver. 1.10: Address 219
 - 2) Ver. 1.00: Address 199
6. Set the selected parameter to 99 with the POWER knob on the control box.
7. Press the reset switch.
8. Change the parameter value to the recorded one.
9. Set DIP SW 1 to 6 on the control box to the ON position.
10. Turn the key switch to the OFF position.

7.5 Parameter Setting

1. Set DIP SW 6 on the control box to the OFF position.
2. Press the INTERVAL switch once. Select the parameter address to be changed with the TIME switches. Change the value by turning the POWER knob.
3. Press the reset switch to ensure the setting.
 - * Check that two beeps are heard when the reset switch is pressed.
4. After parameter change, press the INTERVAL switch once.
5. Set DIP SW 6 on the control box to the ON position.

7.6 Service Mode Indications Display

1. Set DIP SW 8 on the control box to the OFF position.
2. Continue to press the reset switch on the control box until the item on the COUNTER display and value on the POWER display appear.
3. Turning the POWER knob while pressing the reset switch changes the item on the COUNTER display.

COUNTER display	Contents	Unit
d1 p	Laser head single output with the monitor inside the laser head	mW
d2 p	Control monitor for high output inside the shutter	mW
d3 p	Surveillance monitor for high output inside the shutter	mW
d2Lp	Control monitor for low output inside the shutter	0.1 mW
d3Lp	Surveillance monitor for low output inside the shutter	0.1 mW
Ld c	Current of the laser diode for excitation	A
Flo	Cooling device flow amount (3.0 L or less: warning, 2.2 L or less: stop)	L

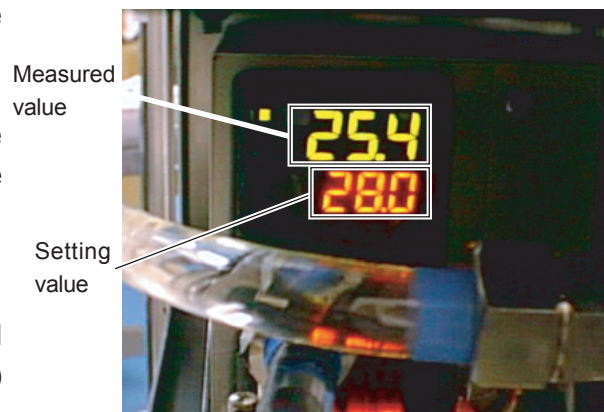
4. After checking the service mode indication, set DIP SW 8 on the control box to the ON position.

7.7 Supplying Cooling Water and Setting Flow Amount

1. Supply pure water to the 1.5 liter line of the chiller.
The water level lowers when the chiller functions, so resupply the water to the 1.5 liter line.
* Be sure to check that the water level is between the upper and lower lines.
2. Turn the two chiller switches and side breaker on and check that the water does not leak.
3. Set DIP SW 8 on the control box to the OFF position.
4. Turning the POWER knob while pressing the reset switch on the control box displays Flo on the COUNTER display and flow amount on the POWER display.
* Keep the reset switch pressed.
5. Turn V101 in the side of the cooling device (17350-E001) so that the value on the POWER display becomes 3.7 ± 0.1 .

7.8 Water Temperature Setting

1. Set the water temperature of the cooling device (17350-E001) as follows:
 - 1) For the devices of S/No. 30123 or earlier, set the water temperature with r or s while pressing the * switch of the temperature indicator.
 - 2) For the devices of S/No. 30123 or later, set the water temperature with $\wedge$ or $\vee$.
 * The target temperature is printed on the label affixed to the laser head ASSY. (17350-1100) side.
 * When the MC-300 stops, turn the power on again.



7.9 Cooling Device Idling Time Measurement

- * Perform the measurement only when the relay board (17350-BA03) is replaced.
1. Turn the power off and wait for five minutes or more.
 2. Turn the power on and measure the idling time with a stop watch.
 3. Turn the key switch to the ON position. Measure the time until countdown starts when the Cool and IdLE indications disappear from the COUNTER and POWER displays respectively.
 4. Check that the measured time is between 150 and 240 seconds.
* When the time is out of the range, peel off the RY3 protective film on the relay board, turn the VR in 1.5 increments (3 minutes), and affix the film again.

7.10 Laser Power Output Adjustment

1. Turn the main switch on and turn the key switch to the ON position.
2. Wait until the Cool and IdLE indications disappear from the COUNTER and POWER displays respectively and the MC-300 goes into STANDBY (when the water temperature of the cooling device reaches the set temperature (about 28 °C)).
3. Set DIP SW 1, 2, 4, and 6 to the OFF position.
4. Install a power meter (COHERENT MODEL 201) in the fiber optic cable connector (DELIVERY 1 side).
 - * Disconnect the fiber optic and delivery unit cables.
5. Set parameters for Address 178 to 03 and Address 69 to 00.
6. Turn VR2 on the master board (17350-BA01) when the treatment beam does not light up so that the voltage between TP15 and A_GND on the master board becomes DC 0 ±0.05 V or less.
 - 1) Turning the VR clockwise changes the voltage to the minus side.
 - 2) Turning the VR counterclockwise changes the voltage to the plus side.
7. Minimize the aiming beam output with the AIMING switch.
8. Set the treatment beam output to 700 mW.
9. Press the STATUS switch to put the MC-300 in READY and press the foot switch to emit the treatment beam.
10. Turn VR3, VR4, and VR5 counterclockwise to adjust the treatment beam output of each color as shown in the right table.
11. Set parameters for Address 178 to 00 and Address 69 to 01.
12. Set DIP SW 1, 2, 4, and 6 to the ON position.

Color	VR	Power(W)
GRN	3	3.1
YEL	4	1.08
RED	5	1.08

7.11 Monitor Adjustment

7.11.1 First Monitor Adjustment

1. Set DIP SW 1, 2, 4, 6, and 8 to the OFF position.
2. Set parameters for Address 178 to 03 and Address 69 to 00.
3. Set the color to GRN and output to 700 mW with the control box.
4. Perform adjustment while checking that the output becomes 3.1 W in the fiber optic cable connector.
5. Adjust VR6 so that the d1 p value becomes 3100 ±100.
 - 1) Turning the VR clockwise changes the voltage to the minus side.
 - 2) Turning the VR counterclockwise changes the voltage to the plus side.
6. Set parameters for Address 178 to 00 and Address 69 to 01.
7. Set DIP SW 1, 2, 4, 6, and 8 to the ON position.

7.11.2 Second and third monitors adjustment

7.11.2.1 Adjustment in high power mode

1. Disconnect the fiber optic and delivery unit cables.
2. Set DIP SW 1, 2, 4, 6, and 8 to the OFF position.
3. Set parameters for Address 178 to 00 and Address 69 to 00.
4. Install a power meter in the fiber optic cable connector and perform adjustment while checking the output..
5. Turn the aiming off, connect the digital tester between TP3 and A_GND, and adjust VR12 so that the TP3 voltage becomes DC 0 V.

6. Adjust VR9, VR10, and VR11 so that the d2 p value or TP3 voltage becomes as shown in the right table when the settings are as follows:

Aiming beam output: minimum

Status: READY

Color	Actual output (W)	Voltage (V)	d2 p	VR
GRN	2.0	2.0 ± 0.1	2000	9
YEL	0.7	1.4 ± 0.1	700	10
RED	0.7	1.4 ± 0.1	700	11

GRN: 2000 mW (VR9), YEL: 700 mW (VR10), RED: 700 mW (VR11)

* Adjust VR9, VR10, and VR11 after the laser output becomes stable.

7. Adjust VR17 so that the TP4 voltage becomes DC 0 V when the treatment beam is off.

8. Adjust VR14, VR15, and VR16 so that the d2 p and d3 p values, or the TP3 and TP4 voltages are the same when the settings are as follows:

Aiming beam output: minimum

Status: READY

Color	POWER(mW)	VR
GRN	2000	14
YEL	700	15
RED	700	16

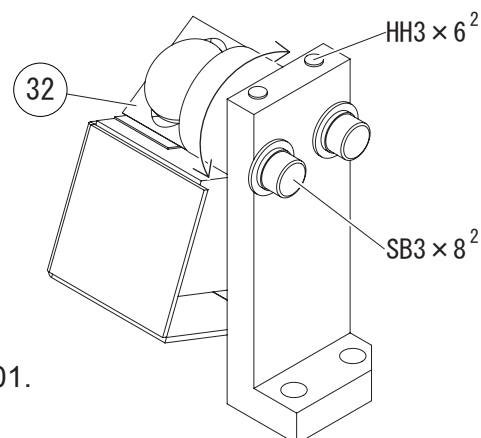
GRN: 2000 mW (VR14), YEL: 700 mW (VR15), RED: 700 mW (VR16)

* To measure the TP3 and 4 voltages, prepare two testers and measure them simultaneously.

9. When the adjustment cannot be performed, adjust the inclination of the mirror mount (17350-M032) of the monitor ASSY. (17350-1240) as follows:

- 1) Loosen SB3 $\times$ 8 (n = 2).
- 2) Adjust the inclination of the mirror mount with HH3 $\times$ 6 (n = 2).
- 3) After adjustment, fix the mirror mount with SB3 $\times$ 8 (n = 2).

10. Perform adjustment by repeating from Step 5.
11. After the adjustment, set parameter for Address 69 to 01.
12. Set DIP SW 1, 2, 4, 6, and 8 to the ON position.



7.11.2.2 Adjustment in low power mode

1. Connect a digital tester between TP1 and A_GND, and TP2 and A_GND on the master board (17350-BA01).
 - 1) TP1: Second monitor
 - 2) TP2: Third monitor
2. Set the color to GRN and turn the aiming off. Adjust VR13 and VR18 so that the voltage between TP1 and TP2 becomes DC 0 V.
 - 1) TP1: VR13
 - 2) TP2: VR18
3. Disconnect the tester.

7.12 Current Signal Adjustment

1. With a clamp tester
 - 1) Install the clamp tester in the red wire side of the laser head power supply.
 - 2) Turn the aiming off and adjust VR8 so that the clamp tester reads 0 A.
 - 3) Adjust VR7 so that the current measured with the tester becomes the same as the Ld c value when the settings are as follows:
Laser color: GRN
Treatment beam output: 1000 mW
Aiming beam output: Minimum
Status: READY
 - 4) Repeat Steps 2) to 3).
2. Without the clamp tester
 - 1) Adjust VR8 so that the Ld c value becomes 0.
 - 2) Adjust VR7 so that the Ld c value becomes 1000 mW when the settings are as follows:
Laser color: GRN
Treatment beam output: 1000 mW
Aiming beam output: Minimum
Status: READY
 - 3) Repeat Steps 1) to 2).

7.13 Overpower and Underpower Adjustment

7.13.1 Overpower and underpower adjustment of second monitor

1. Set DIP SW 1, 2, and 6 to the OFF position.
2. Set parameter for Address 1 to 01.
3. Set the color and output as shown in the right table and measure the TP1 and TP3 voltages when the treatment beam is emitted.
* Connect a digital tester between each TP and A_GND.

Monitor	TP	VR	Color	Power (mW)			
Second	1	13	GRN	50	90	100	300
			YEL	50	90	100	150
			RED	50	90	100	150
	3	12	GRN	310		500	
			YEL	160		400	
			RED	160		400	

4. Set parameter for Address 69 to 00.
5. Turn VR12 and VR13 to check that INTLK 2.7 and ERR 10 occur in the second monitor.
 - 1) When the output is less than 100 mW:
INTLK 2.7 occurs when the voltage of each output in TP1 is +50% or more.
ERR 10 occurs when the voltage of each output in TP1 is -50% or less.
 - 2) When the output is 100 mW or more:
INTLK 2.7 occurs when the voltage of each output in TP3 is +25% or more.
ERR 10 occurs when the voltage of each output in TP3 is -25% or less.

6. When INTLK 2.7 and ERR 10 do not occur, set the parameters as shown in the right table.
7. Turn the aiming off and adjust VR13 and VR12 so that the TP1 and TP3 voltages become DC 0 V.
 - 1) TP1: VR13
 - 2) TP3: VR12

Condition		Address	
Laser color	Output	In. 2.7	Err 10
GRN	50 mW to 90 mW	62	63
	100 mW to 300 mW	58	59
	310 mW or more	54	55
YEL/RED	50 mW to 90 mW	64	65
	100 mW to 150 mW	60	61
	160 mW or more	56	57

8. Set parameters for Address 1 to 00 and Address 69 to 01.
9. Set DIP SW 1, 2, and 6 to the OFF position.
10. Perform overpower and underpower adjustment of the third monitor (see 7.13.2).

7.13.2 Overpower and underpower adjustment of third monitor

1. Set DIP SW 1, 2, and 6 to the OFF position.
2. Set parameter for Address 1 to 01.
3. Set the color and output as shown in the right table and measure the TP1, TP2, TP3, and TP4 voltages when the treatment beam is emitted.

* Connect a digital tester between each TP and A_GND.

4. Set parameter for Address 69 to 00.
5. Turn VR17 and VR18 to check that INTLK 2.7 and ERR 10 occur in the third monitor.

- 1) When the output is less than 100 mW:

INTLK 2.7 occurs when the voltage of each output in TP2 is +50% or more.

ERR 10 occurs when the voltage of each output in TP2 is -50% or less.

- 2) When the output is 100 mW or more:

INTLK 2.7 occurs when the voltage of each output in TP4 is +25% or more.

ERR 10 occurs when the voltage of each output in TP4 is -25% or less.

6. When INTLK 2.7 and ERR 10 do not occur, set the parameters as shown in the right table.

7. Turn the aiming off and adjust VR18 and VR17 so that the TP2 and TP4 voltages become DC 0 V.

- 1) TP2: VR18

- 2) TP4: VR17

Monitor	TP	VR	Color	Power (mW)			
Third	2	18	GRN	50	90	100	300
			YEL	50	90	100	150
			RED	50	90	100	150
	4	17	GRN	310		500	
			YEL	160		400	
			RED	160		400	

Condition		Address	
Laser color	Output	In. 2.7	Err 10
GRN	50 mW to 90 mW	62	63
	100 mW to 300 mW	58	59
	310 mW or more	54	55
YEL/RED	50 mW to 90 mW	64	65
	100 mW to 150 mW	60	61
	160 mW or more	56	57

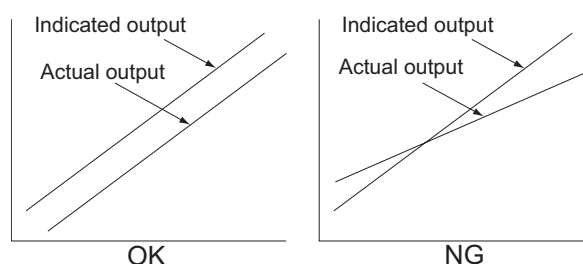
8. Set parameters for Address 1 to 00 and Address 69 to 01.
9. Set DIP SW 1, 2, and 6 to the OFF position.
10. When the parameter setting is changed, perform overpower and underpower adjustment of the second monitor (see 7.13.1).

7.14 Aiming Monitor Origin Adjustment

1. Disconnect the fiber optic and delivery connector cables.
2. Install a power meter (LASER MATE Q) in the fiber optic cable connector.
3. Set DIP SW 1, 2, and 6 to the OFF position.
4. Set parameter for Address 189 to 03. Check that the polarizing plate (17162-G008) inside the wavelength plate ASSY. (17350-1221) is placed long edge horizontal (the 100% position).
5. Minimize the aiming beam output and make a record of the output measured with the power meter.
6. Turn the aiming off, set parameter for Address 189 to 01, move the polarizing plate at an angle of 45° (the 50% position).
7. Minimize the aiming beam output. Change the value in Address 176 from 250 until the measured power becomes half the power of that in Step 5.
 - * Decrease the parameter value to increase the measured value. When the parameter value shifts largely (such as 450), affix the polarizing filter of the aiming motor again to adjust the angle.
8. Set parameter for Address 189 to 00.
9. Set DIP SW 1, 2, and 6 to the ON position.
10. Check that the aiming motor rotates when the aiming beam output is changed with the AIMING switches.

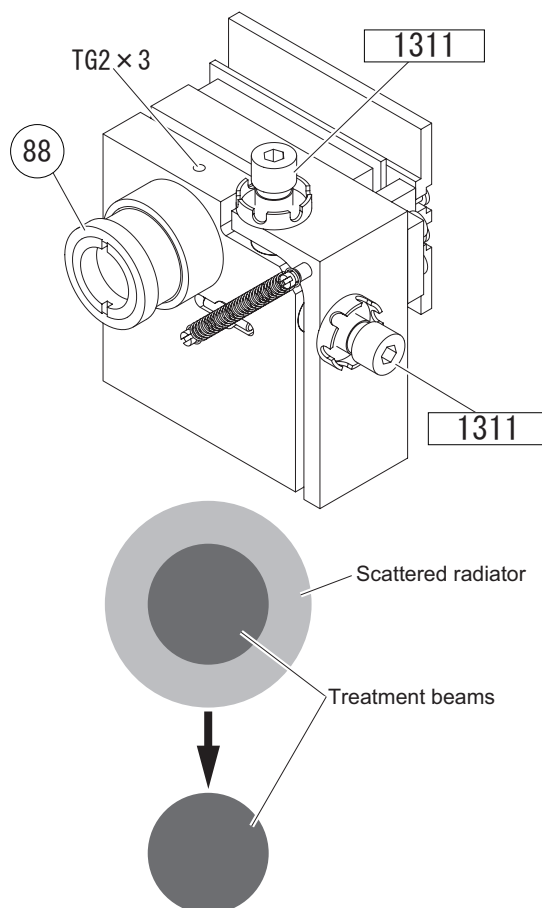
7.15 Power Output Check

1. Set DIP SW 8 to the OFF position.
2. Measure the following outputs of each color in the fiber optic cable connector. Check that they are within $\pm 20\%$ of the displayed ones.
 - 1) RED, YEL: 50, 100, 200, 500, 600, 700 mW
 - 2) GRN: 50, 100, 200, 500, 600, 700, 1000, 1500, 2000 mW
3. Check that the relationship between the indicated and actual output is as shown in the right figures (only DELIVERY 1).
4. If the relationship is not parallel, see 7.12.
5. When d2 p is displayed on the COUNTER display, check the d2 p value on the POWER display becomes the same as the actual one.
6. Likewise, when d3 p is displayed on the COUNTER display, check the d3 p value on the POWER display becomes the same as the actual one.
7. Set DIP SW 8 to the ON position.



7.16 Fiber Optic Cable Alignment

- Set the MC-300 as follows:
Laser color: GRN, aiming beam output: minimum, treatment beam output: 200 mW
- Emit the treatment beam on a wall at a distance of 0.5 to 1.0 m away from the end of the fiber optic cable.
- Adjust the condenser lens position with the adjusting screw ASSYs [13750-1311 (n = 2)] so that there is no scattered radiation for each laser color.
- When the scattered radiation does not disappear, perform the following:
 - Turn the lens holder (17350-M088) to adjust the condenser lens forward and backward. Fix the condenser lens with TG2 $\times$ 3 temporarily.
 - Perform Step 3.
 - Repeat 1) to 2) until the scattered radiation disappears.
- Fix the lens holder (17350-M088) with TG 2 $\times$ 3 and the adjusting screw ASSYs with the lock ring (17350-M070).
 - * Be sure that all three colors are in the proper condition when fixing the lens holder and ASSYs.
 - * Perform this alignment in both DELIVERY 1 and DELIVERY 2.



7.17 Delivery Unit Coagulation Output Adjustment

- Install a power meter at the delivery unit laser aperture. At this time, the treatment beam should be out of focus.
- Connect the slit lamp delivery unit to DELIVERY 1. Change the parameters so that the actual values in 50 mW and maximum output become the same as those indicated on the control box when the spot size is 500, 50 to 90 μ m.
- Connect the BIO delivery unit to DELIVERY 1 and DELIVERY 2. Adjust as in Step 2.
 - * Increase the parameter value to increase the output.
- Measure the outputs of each color in increments of 100 mW. When they are not within $\pm 10\%$, change the parameters (GRN: Address 119 to 138, YEL: Address 140 to 147, RED: Address 150 to 157).

		Laser	Address		
			GRN	YEL	RED
Offset	DELIVERY1		20	30	40
	DELIVERY2 (except for SL)		21	31	41
Slit lamp (SL)	500 μ m		22	32	42
	50 μ m		100	105	110
	60 μ m		101	106	111
	70 μ m		102	107	112
	80 μ m		103	108	113
	90 μ m		104	109	114
Endophoto	DELIVERY1		24	34	44
	DELIVERY2		25	35	45
BIO	DELIVERY1		26	36	46
	DELIVERY2		27	27	47

7.18 Aiming Beam Output Adjustment

1. Connect the slit lamp delivery unit to DELIVERY 1.
2. Install a power meter (LASER MATE Q) to the laser aperture of the delivery unit. At this time, the treatment beam should be out of focus.
 - * Change the wavelength of the power meter depending on the laser color.
 - 1) GRN: 532 nm
 - 2) YEL: 561 nm
 - 3) RED: 659 nm
3. Maximize the aiming beam output.
4. Check that the measured values are as follows:
 - 1) GRN: 0.1 mW $\pm$ 0.05 mW
 - 2) YEL: 0.1 mW $\pm$ 0.05 mW
 - 3) RED: 0.5 mW $\pm$ 0.20 mW
 - * When the values are not within the specifications above, change the parameter value as shown in the right table.
 - * Set the parameter value to 100 or less.
 - * When the parameter value is decreased, the output decreases.
5. Minimize the aiming beam output.
6. Check that the aiming beam output is 1/8 or less of the maximum.
7. Check that the actual aiming beam output changes depending on the setting on the control panel.
8. Turn the aiming off.

Spot size	Conditions		Parameter		
	Indication	Status	GRN	YEL	RED
500 μ m	—	STANDBY	186	187	188
	500 mW	READY	183	184	185
	510 mW	READY	180	181	182
50 μ m	—	STANDBY	115	116	117

7.19 LD Aiming Beam Output Adjustment

1. Connect the BIO delivery unit to DELIVERY 2. Press channel switch 2 to select CH2.
2. Install a power meter (LASER MATE Q) to the laser aperture of the delivery unit. At this time, the treatment beam should be out of focus.
Change the wavelength of the power meter to 635 nm.
3. Set parameter for Address 14 to 03.
4. Maximize the aiming beam output.
5. Change the value of Address 17 so that the actual aiming beam output becomes 0.3 $\pm$ 0.1 mW.
6. Minimize the aiming beam output.
7. Change the value of Address 19 so that the aiming beam output is 1/8 or less of that in Step 5.
8. Check that the actual aiming beam output changes depending on the setting on the control panel.
9. Connect a digital tester between TP9 and A_GND. Check that the voltages are 1 V or less when the aiming beam output is set to maximum and minimum.
10. Set parameter for Address 14 to 00.
11. Turn the aiming off.

7.20 Coagulation Time Setting

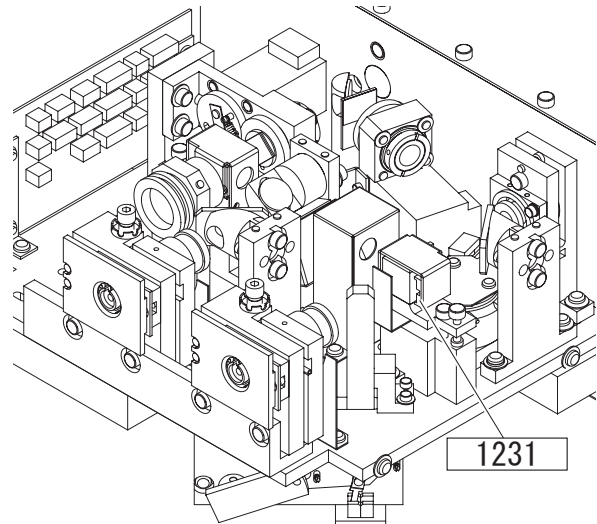
1. Connect any delivery unit to the MC-300.
2. Install an analyzing recorder (YOKOGAWA Model: 3656) to the laser aperture of the delivery unit. At this time, the treatment beam should be out of focus.
3. Set the spot size of the delivery unit to 200 μm .
4. Emit the treatment beam with the laser output of 200 mW. Change the value of Address 52 so that the coagulation time is within the following standards.
 - a. 0.02 sec $\pm 20\%$
 - b. 0.10 sec $\pm 10\%$
 - c. 1.00 sec $\pm 10\%$
 - d. 3.00 sec $\pm 10\%$

7.21 Repeat Time Setting

1. Connect any delivery unit to the MC-300.
2. Install an analyzing recorder (YOKOGAWA Model: 3656) to the laser aperture of the delivery unit. At this time, the treatment beam should be out of focus.
 - * When the analyzing recorder is not available, measure TP20 on the master board (17350-BA01) with an oscilloscope.
3. Set the spot size of the delivery unit to 200 μm .
4. Set parameter for Address 14 to 00.
5. Emit the treatment beam with the laser output of 200 mW. Change the value of Address 53 so that the repeat time is within the following standards.
 - a. 0.2 sec $\pm 10\%$
 - b. 0.5 sec $\pm 10\%$
 - c. 1.0 sec $\pm 10\%$
6. Set parameter for Address 14 to 01.
7. Emit the treatment beam with the laser output of 200 mW. Change the value of Address 118 so that the repeat time is within the above standards.
8. Set parameter for Address 14 to 00.

7.22 Aiming Monitor Adjustment

1. Set parameter for Address 1 to 00.
2. Install a digital tester between TP20 and A_GND on the master board (17350-BA01).
3. Turn VR19 on the master board fully counterclockwise.
4. Turn the aiming off. Adjust VR20 so that the voltage is from 0 V to +0.1 V.
5. Check that the TP20 voltage is 1 V or less when the aiming beam output is maximized in each color.
6. Remove the cover (17350-M002) of the shutter ASSY. (Dual) (17350-1200).
7. Illuminate the photoreceptor of BA mount ASSY. 2 (17350-1231) with a penlight. Check that INTLK 5.1 occurs.
 - * At this time, the MC-300 should be in STANDBY.

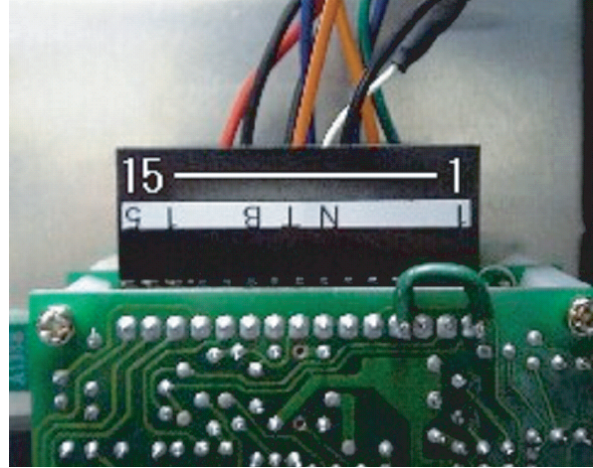


7.23 Slit Lamp Delivery Unit Spot Size Adjustment

1. Connect the slit lamp delivery unit to the MC-300.
2. Check alignment of the spot size indications (50, 200, 500, and 990 μm) on the control box and markings on the slit lamp delivery unit.
3. If there is misalignment, change the following parameters (only Ver. 1.10).
 - 1) Address 148: GAIN
 - 2) Address 149: OFFSET

7.24 Peltier Driver Adjustment

1. Disconnect the delivery unit cable.
2. Set DIP SW1, 2, 6, and 8 to the OFF position.
3. Set parameters for Address 69 to 00 and Address 178 to 02.
4. Set the color to GRN and output to 50 mW.
5. Measure the voltage between the CN2 3rd and 4th pins on the Peltier driver (17350-E900).
 - * Output mirror temperature setting: 1 V = 10°C (Ex: 3.30 V = 33.0°C)
6. Display the d3Lp value.
7. Minimize the aiming beam output.
8. Put the MC-300 in READY with the STATUS switch.



9. Turn the VR while pressing the reset switch and checking the d3Lp value on the POWER display.

* Turn the far right VR viewed from the bottom.

- 1) When decreasing the voltage decreases the d3Lp value:

Set the voltage so that the d3Lp becomes lowest in the range of 2.70 to 3.30 V.

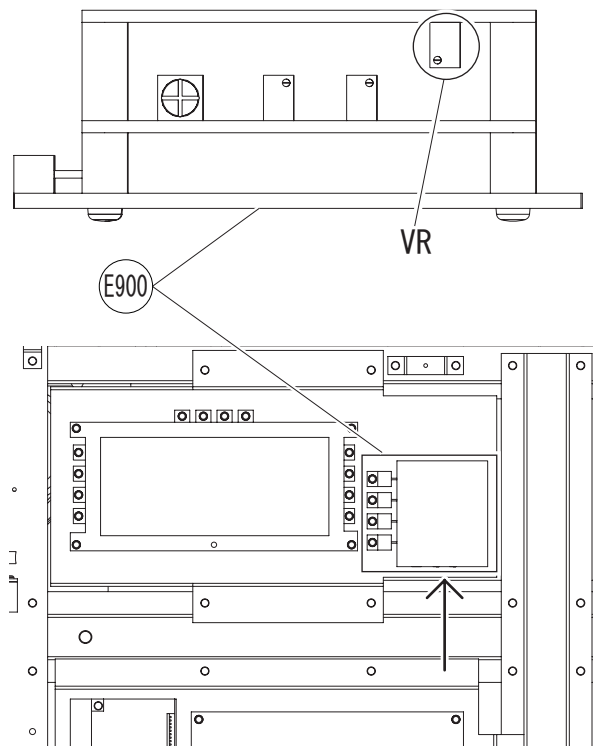
* Before adjustment: 200 to 500

After adjustment: 50 to 150

- 2) When decreasing the voltage increases the d3Lp value:

Set the voltage so that the d3Lp becomes lowest in the range of 3.30 to 3.80 V.

* When the voltage does not change and the d3Lp value is 150 or more, return the MC-300 to the factory.



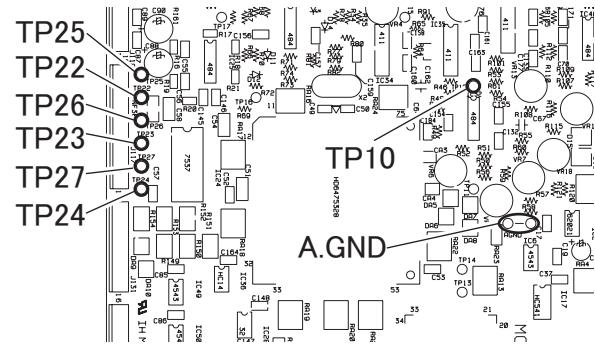
10. Turn the aiming off.
11. Press the STATUS switch to put the MC-300 in STANDBY.
12. Set parameters for Address 69 to 01 and Address 178 to 00.
13. Minimize the aiming beam output, put the MC-300 in READY, and check that INTLK 2.8 does not occur.
 - * When INTLK2.8 occurs, return the MC-300 to the factory.
14. Set DIP SW1, 2, 6, and 8 to the ON position.
15. Connect the delivery unit cable.

7.25 3CH Temperature Control Board Adjustment

1. Disconnect the delivery unit cable.
2. Set DIP SW1, 2, 3, 6, and 8 to the OFF position.
3. Set the output to 50 mW and the color so that ERR 10 occurs.
4. Connect a tester between the following TP and A_GND on the master board. Measure the setting and actual temperatures of the NLO crystal in the laser color selected in Step 3.

* NLO crystal temperature: 1 V = 10°C (Ex: 4.15 = 41.5°C)

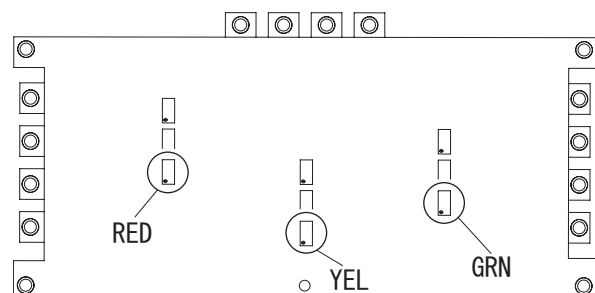
- 1) Setting temperature
 - a. GRN: TP24 – A_GND
 - b. YEL: TP23 – A_GND
 - c. RED: TP22 – A_GND
- 2) Actual temperature
 - a. GRN: TP27 – A_GND
 - b. YEL: TP26 – A_GND
 - c. RED: TP25 – A_GND



5. Minimize the aiming beam output and display the d3Lp value.
6. Set the laser output as follows:
 - 1) GRN: 1000 mW
 - 2) YEL/RED: 300 mW
7. Increase the laser output within the following range in increments of 10 mW. Each time the output is increased, press the reset switch to display the d3 p value.
 - 1) GRN: 1000 to 3100 mW
 - 2) YEL/RED: 300 to 1100 mW
8. Set the treatment beam output in the above range so that the d3 p value becomes maximum.
 - * The d3 p value is unstable so set the value to roughly average.
 - * The current should not be over 25 A.
 - * Check the current with the Ld c value or the voltage between TP10 and A_GND on the master board (LD current: 1 V = 10 A).

9. Turn the VR of the 3CH temperature control board (17350-E006) as shown in the right figure so that the d3 p value becomes maximum while changing the crystal temperature of the laser color selected in Steps 3 and 9 in the range of $\pm 3^\circ\text{C}$.

- * Turn the VR as slowly as it takes about 10 seconds to change the temperature by 1°C.
- * Do not use any VR other than the lowest one for each color.



10. Set parameter for Address 1 to 01 and set DIP SW 3 to the ON position.
11. Press the STATUS switch to put the MC-300 in STANDBY.
12. Emit the treatment beam and check that ERR 10 does not occur.
 - * When ERR 10 occurs, return the MC-300 to the factory.
13. Set parameter for Address 1 to 00 and set DIPSW1, 2, 6, and 8 to the ON position.
14. Connect the delivery unit cable.

7.26 Cooling Water Flow Amount Check

1. Set DIP SW 1, 2, 6, and 8 to the OFF position.
2. Set parameter for Address 177 to 100.
3. If INTLK 4.5 does not appear in normal mode, press the reset switch and measure the flow amount.
4. Set parameter for Address 177 to 176.
5. Set DIP SW 1, 2, 6, and 8 to the ON position.

7.27 Parameter Update

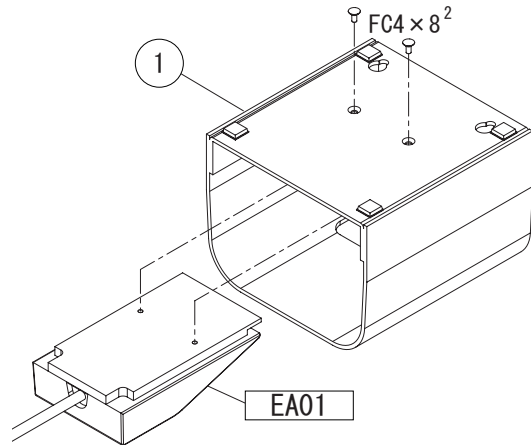
1. Update the program from Ver. 1.00 to 1.10.
2. Set parameter for Address 214 to 50.
3. Press the reset switch on the control box.
 - * The parameter values whose addresses are 200 or later are input automatically.
4. Set parameters for Address 118 to 25, Address 148 to 100, and Address 149 to 100.

7.28 Improving Contact Failure

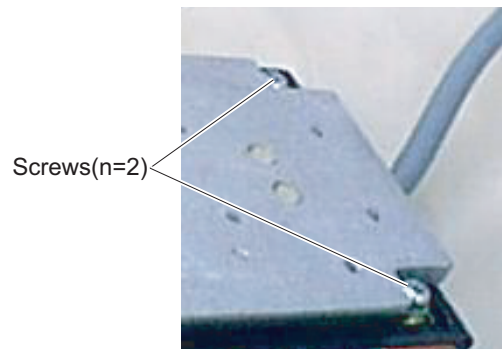
1. Prepare the following:
 - 1) Specified contact oil (A-9300: for tinned copper)
 - 2) Tie Wrap (TR-18): two units or more (prepare as necessary)
 - 3) Cable clamp (CK-20): one unit or more (prepare as necessary)
2. Remove the right cover (see 5.1.2).
3. Disconnect all EH connectors (small white ones) on the master board (17350-BA01) and apply contact oil to the pins on the master board.
4. Tie the single shielded wire of P113 (J113) and adjacent P114 (J114) cable on the master board with a tie wrap (TR-18) so that vibration will not transmit to P113 (J113).
5. Fix the gathered cables around the upper area of the board to the chassis with a cable clamp (CK-20).
6. Tie and fix other cables which are likely to vibrate as many as possible.
7. Check the operation and attach the right cover.

7.29 Foot Switch Adjustment

1. Unscrew FC4 × 8 (n = 2) to remove the foot switch ASSY.(10149-EA01) from the cover (17627-M001).



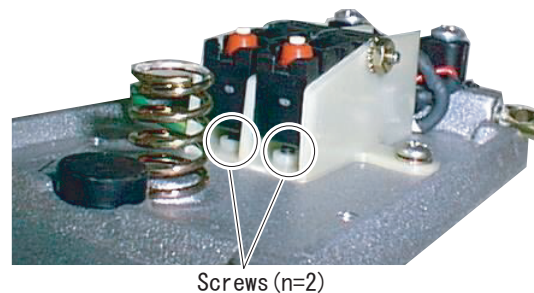
2. Remove the screws (n = 2) and the foot switch cover.



3. Lower the micro switch positioning screws with a 0.05 inch hexagonal wrench so that the screw tips are hidden as shown in the right picture.

* There will be a gap under the micro switch, so push down the switch.

4. Attach the foot switch cover with the screws (n = 2).



5. Insert a 5 mm hexagonal wrench between the switch cover and base, and press them by hand.

6. Rotate a 0.05 inch hexagonal wrench and position it so that the switches (n = 2) are turned on.

* When the switch is turned on, a click sounds.

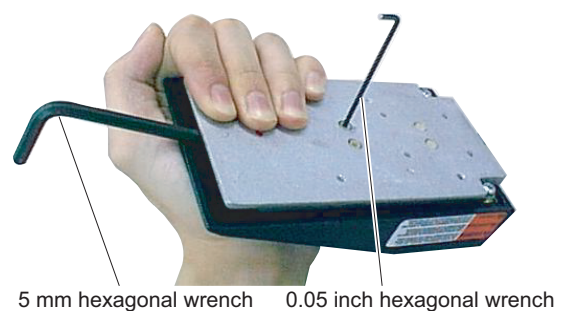
* To align ON position of the two switches, slowly rotate with the 0.05 inch hexagonal wrench one rotation in about 5 seconds.

7. Remove the 5 mm hexagonal wrench and press the switch cover gradually to check that the two switches are turned on simultaneously.

8. If there is misalignment, lower the micro switch positioning screws again and repeat from Step 2.

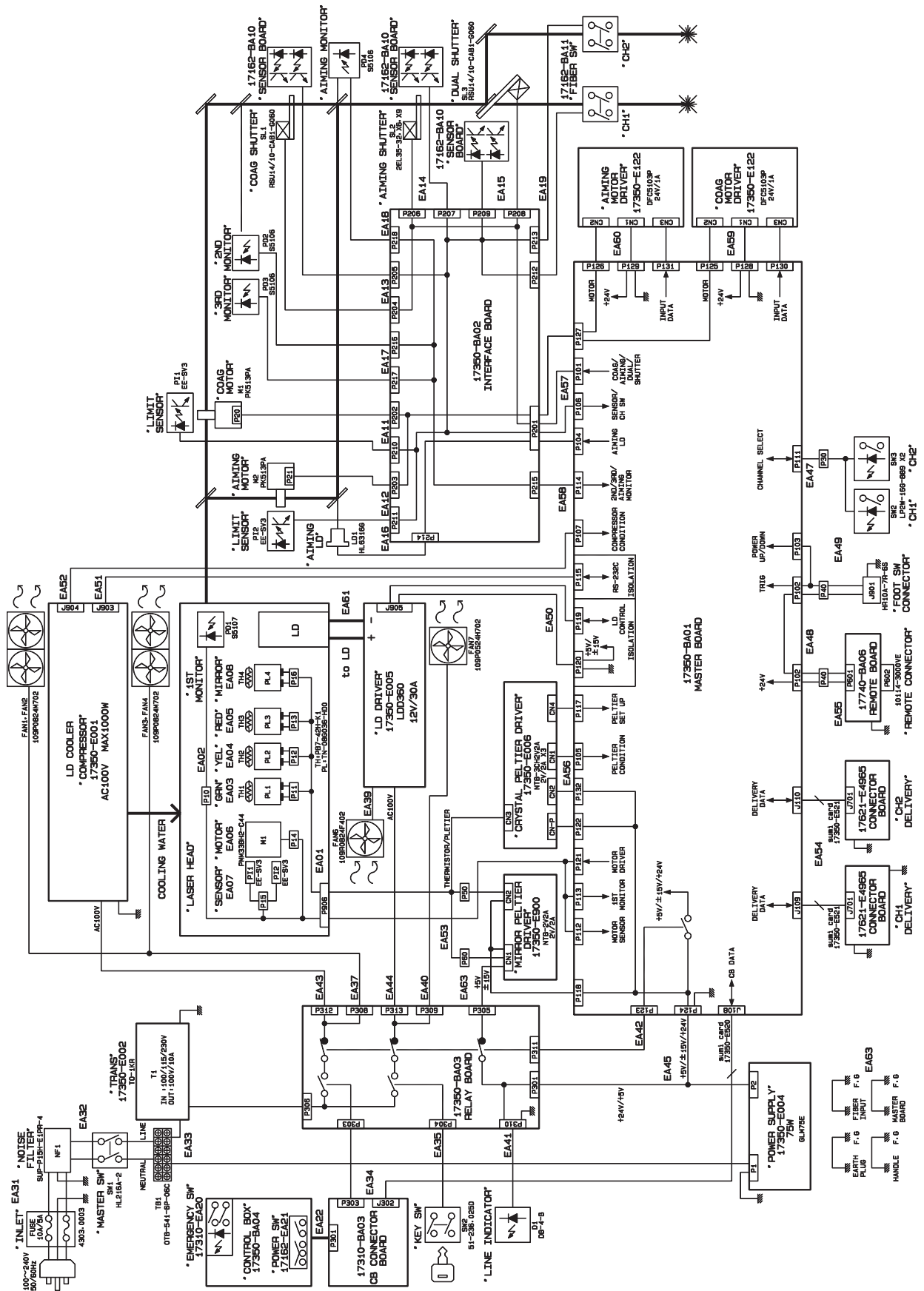
* When performing readjustment, be sure to lower the micro switch by inserting a tool between the switch cover and base after lowering the positioning screws.

9. Attach the foot switch ASSY. (10149-EA019) to the cover (17627-M001) with FC4 × 8 (n = 2).



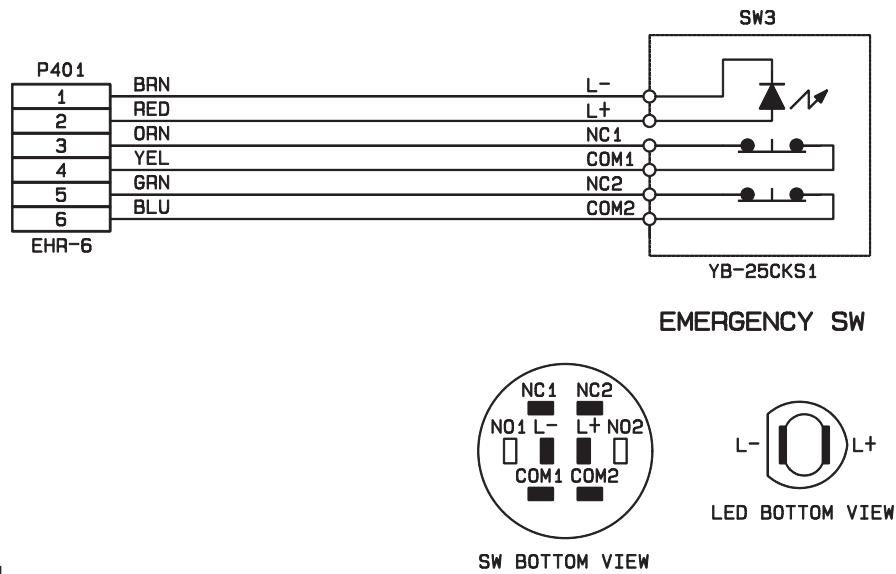
§ 8 SUPPLEMENT

8.1 Wiring Diagram

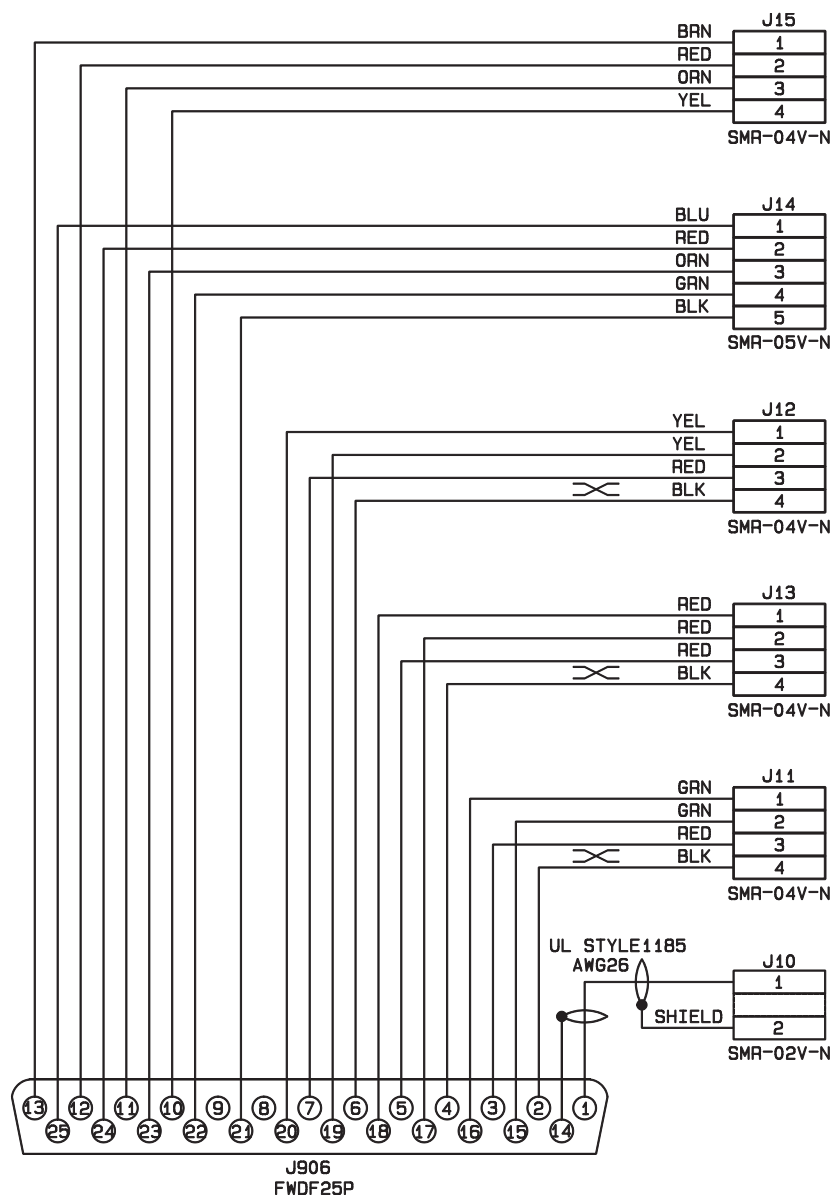


8.2 Connector Cable

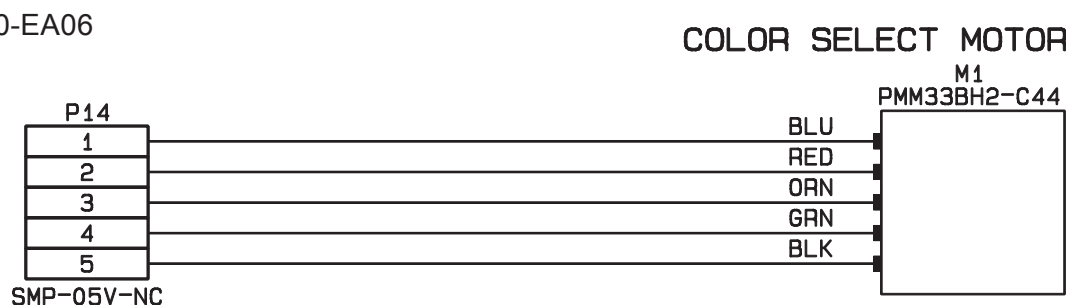
17310-EA20



17350-EA01

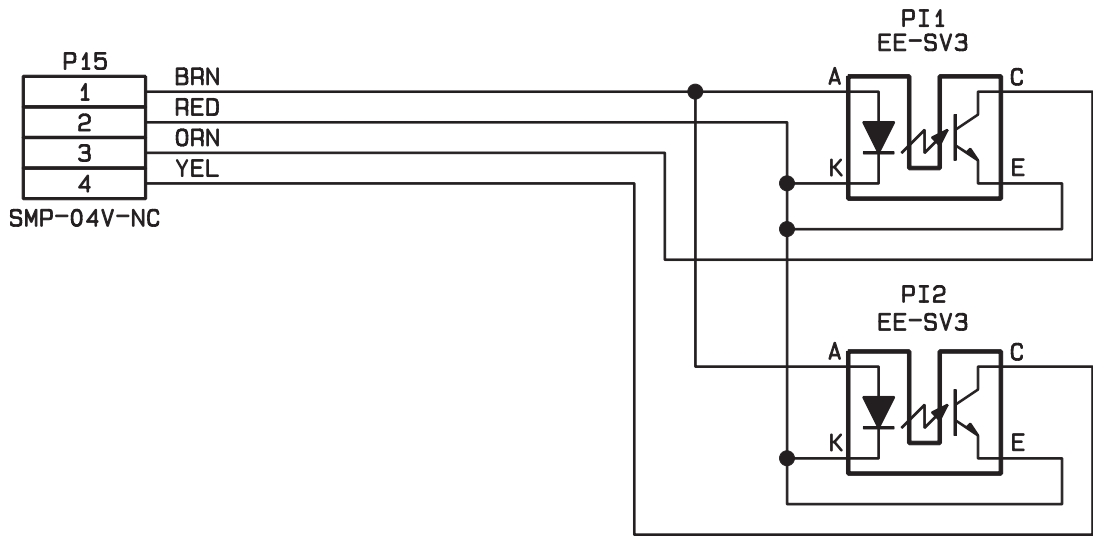


1st MONITOR



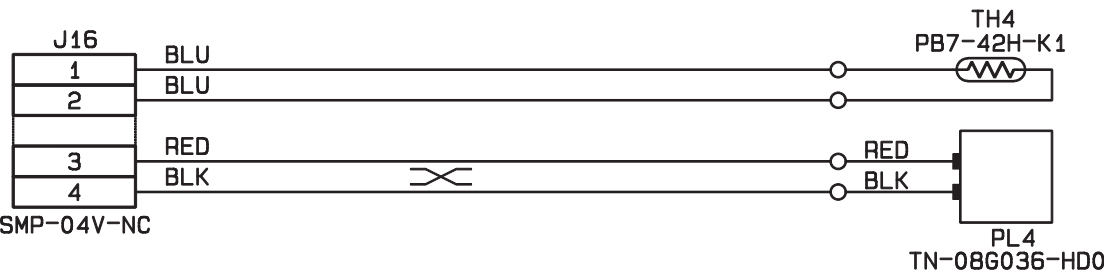
17350-EA07

COLOR SELECT SENSOR



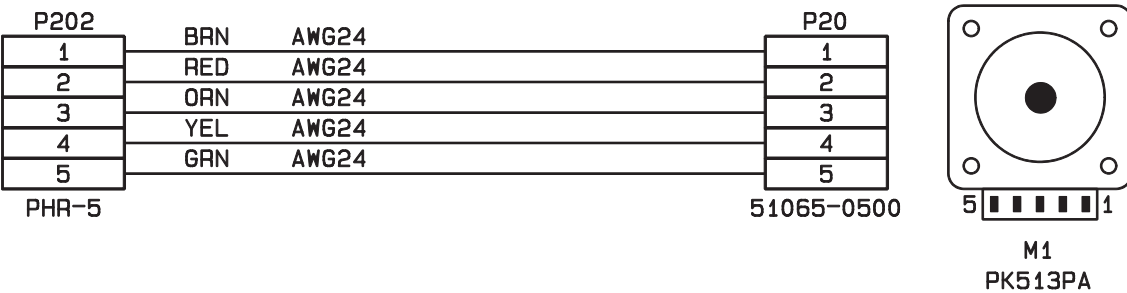
17350-EA08

MIRROR

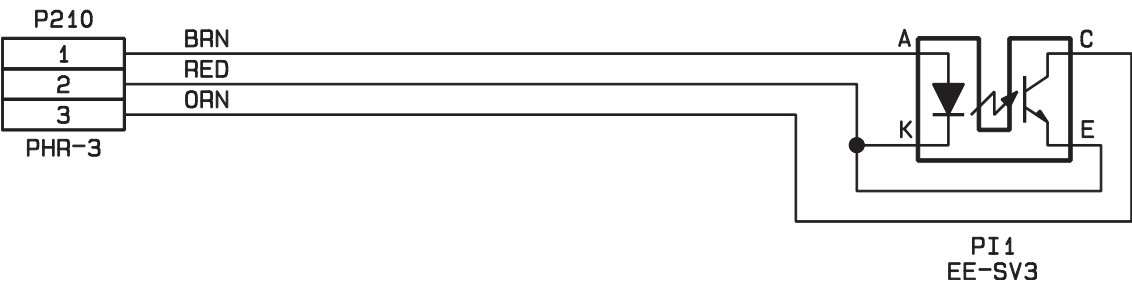


17350-EA11

COAG MOTOR

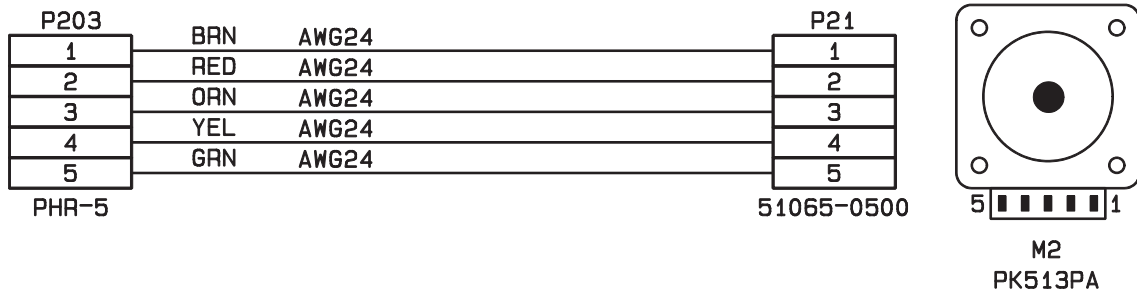
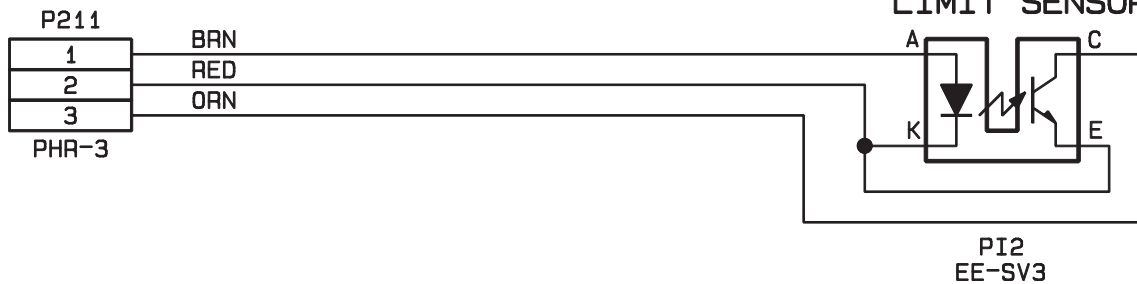


COAG MOTOR
LIMIT SENSOR



17350-EA12

AIMING MOTOR

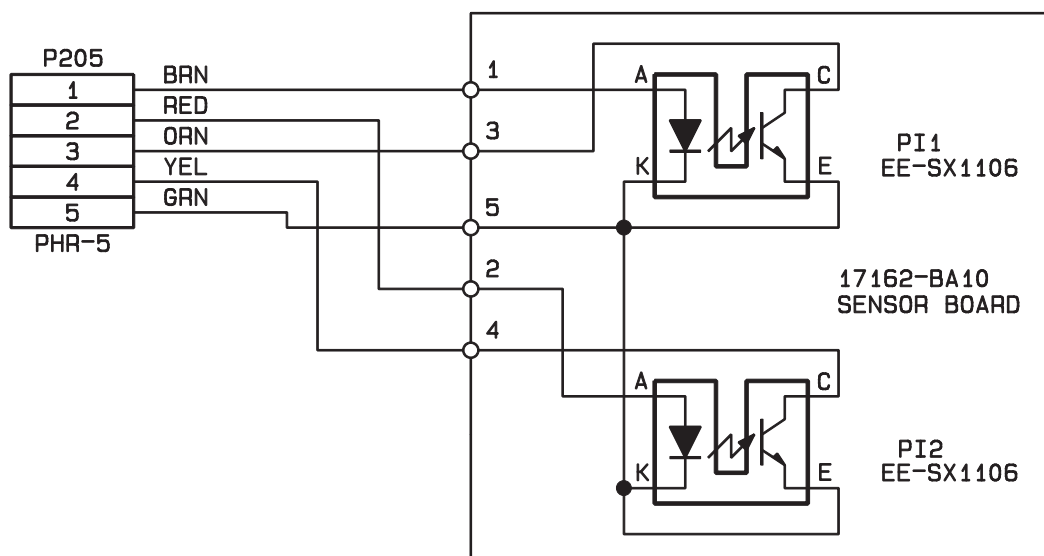
AIMING MOTOR
LIMIT SENSOR

17350-EA13

COAG SHUTTER

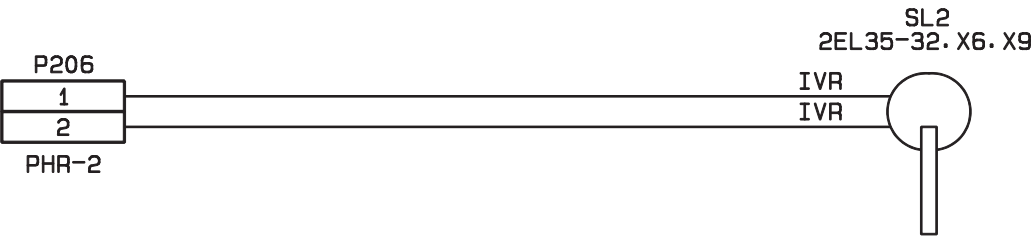


COAG SENSOR

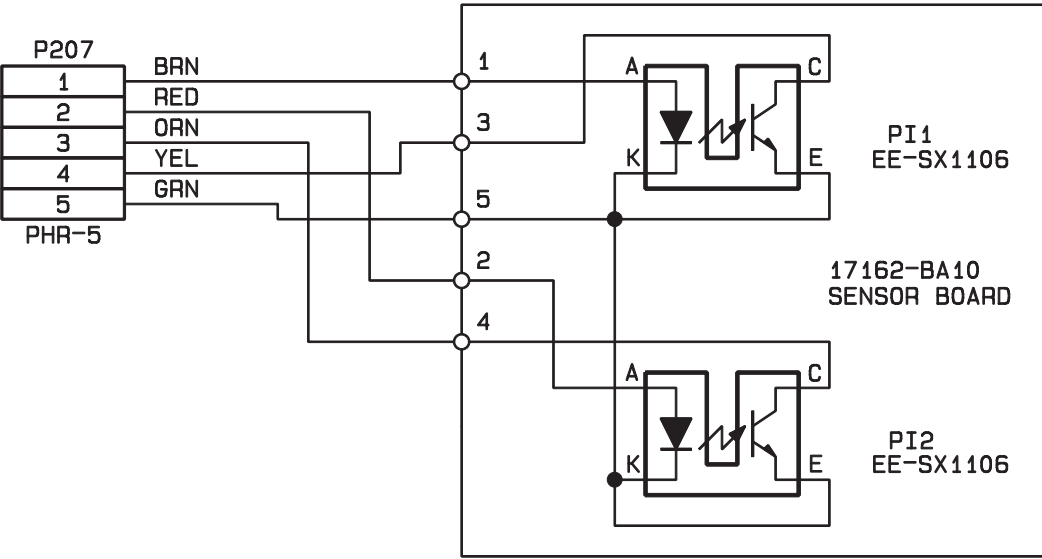


17350-EA14

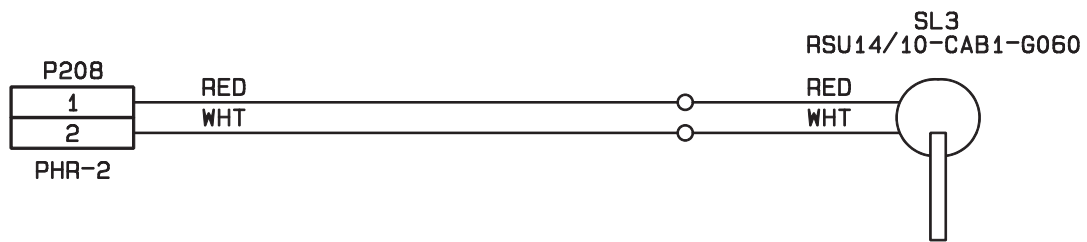
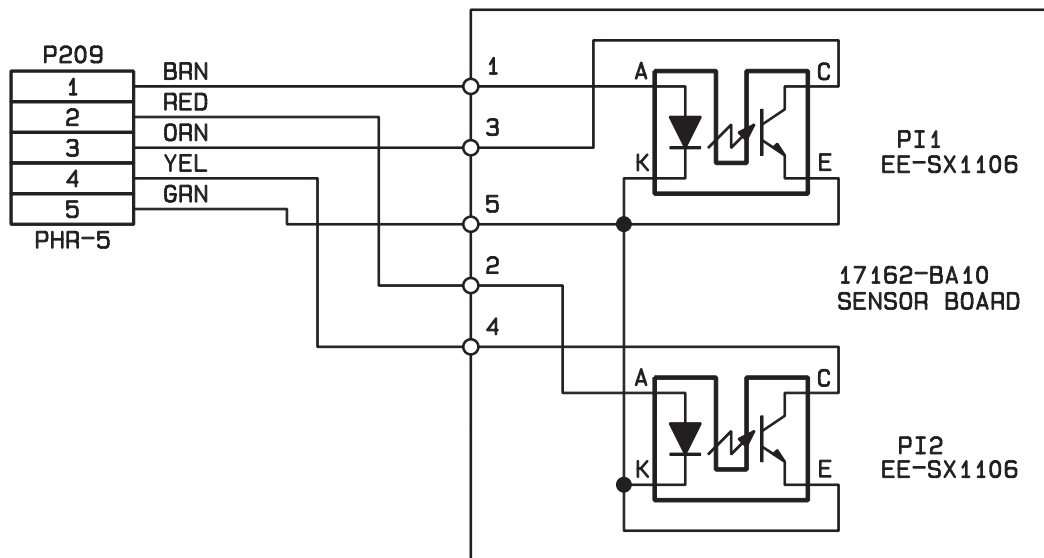
AIMING SHUTTER



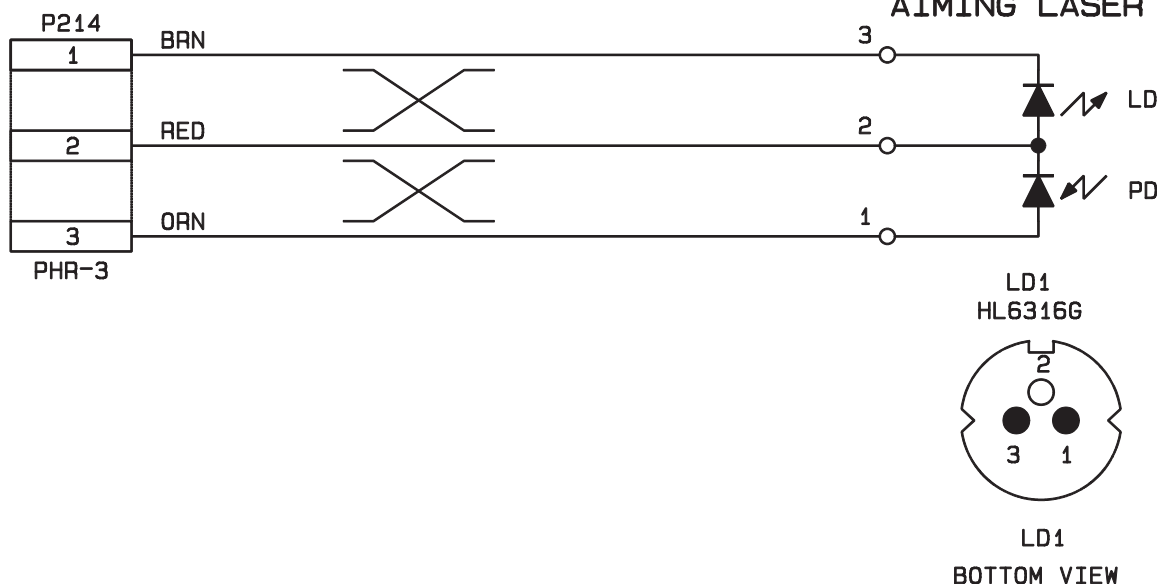
AIMING SENSOR



17350-EA15

DUAL SHUTTER**DUAL SENSOR**

17350-EA16

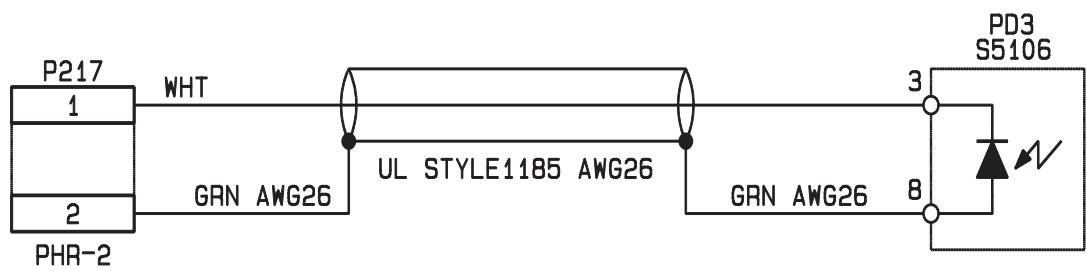
AIMING LASER

17350-EA17

2nd MONITOR

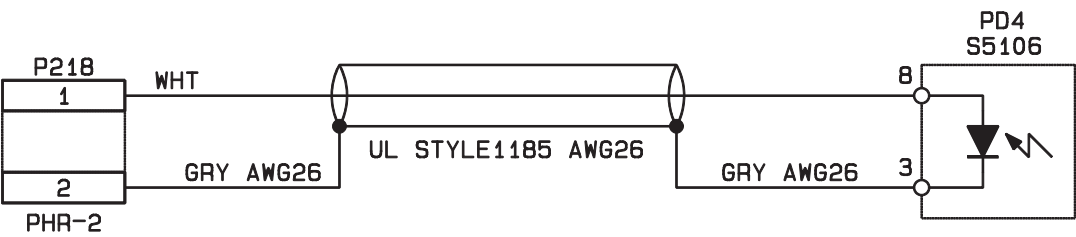


3rd MONITOR'



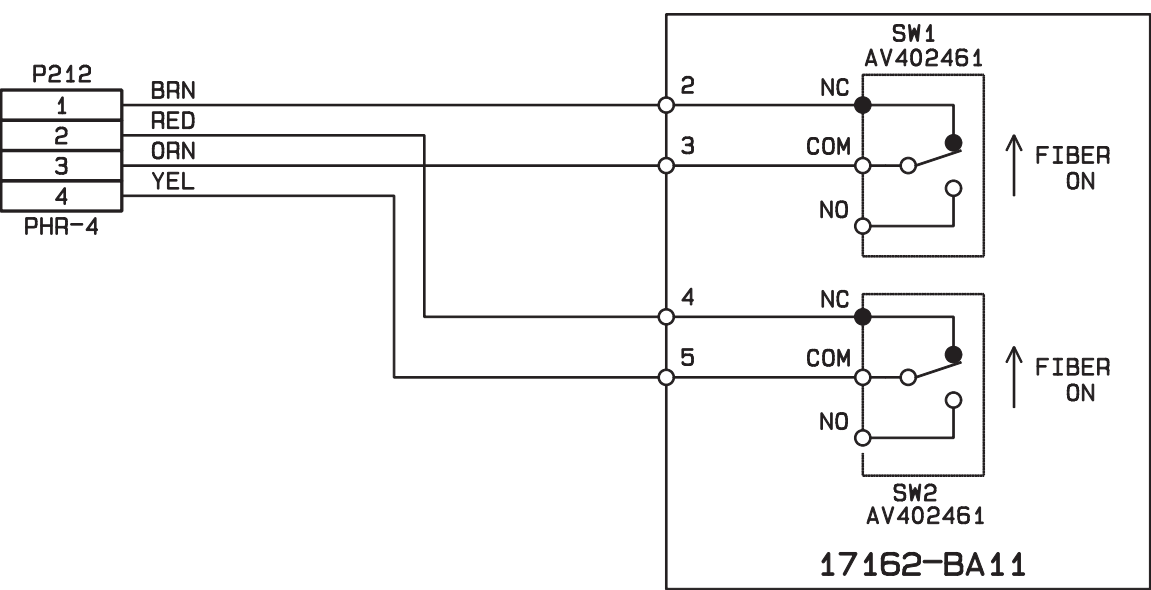
17350-EA18

AIMING MONITOR



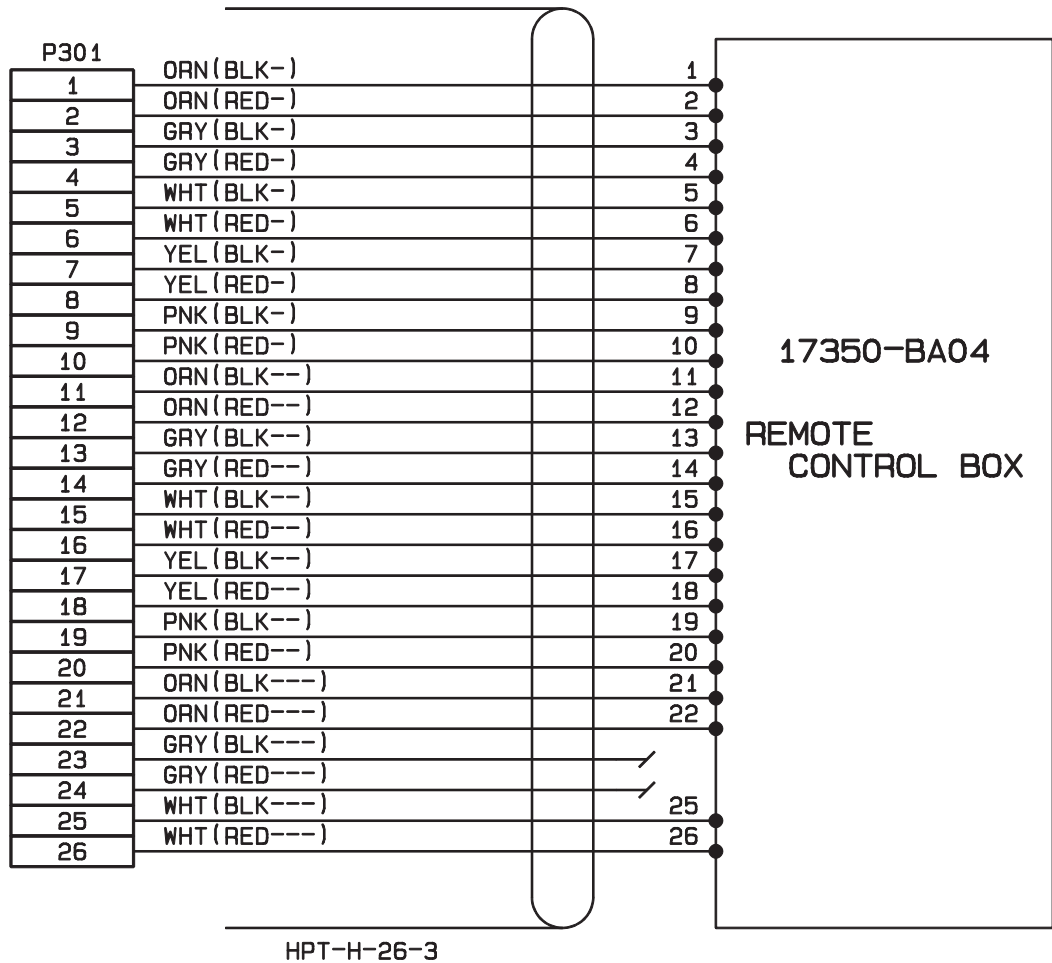
17350-EA19

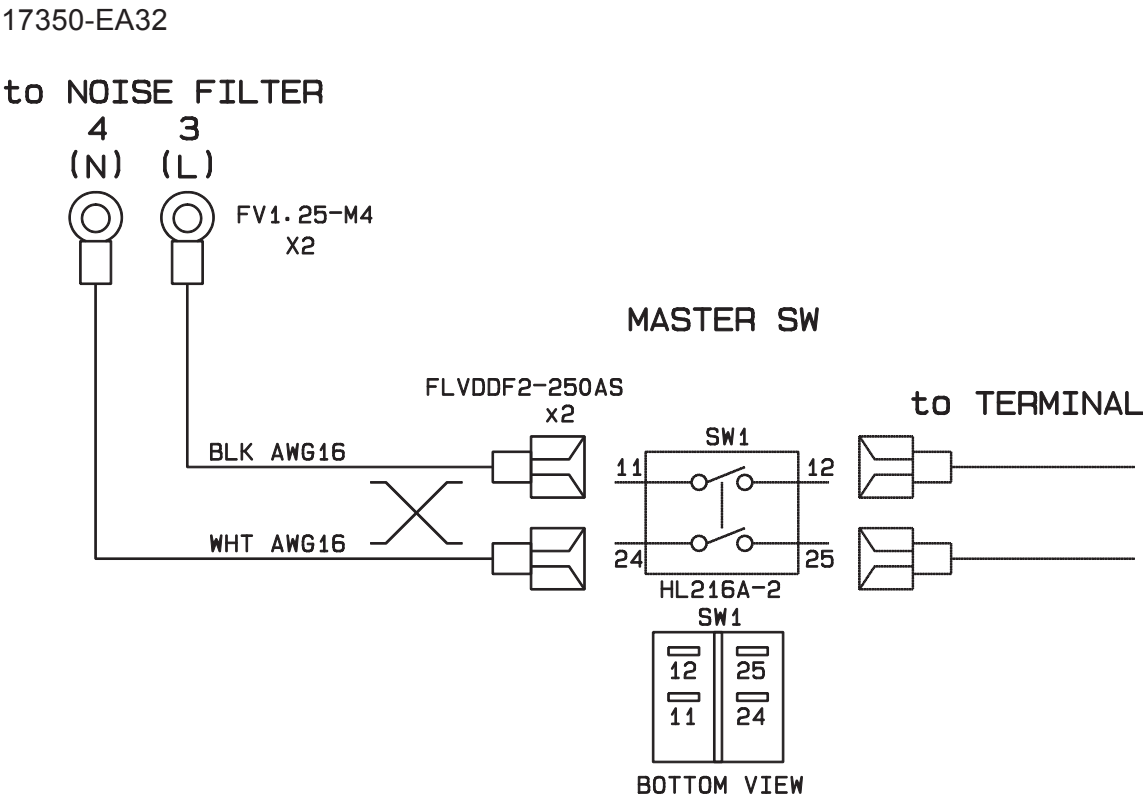
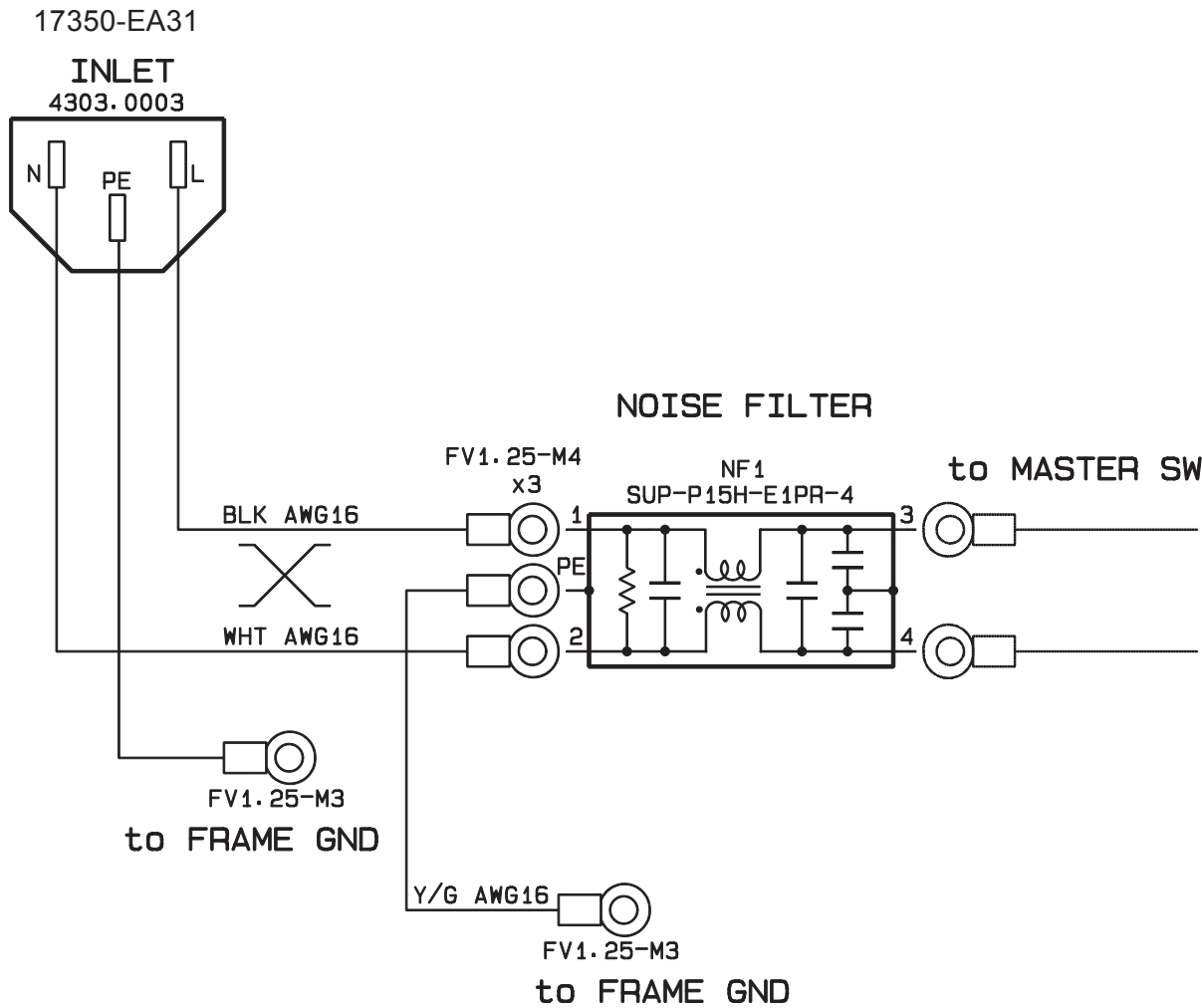
FIBER SW



17350-EA22

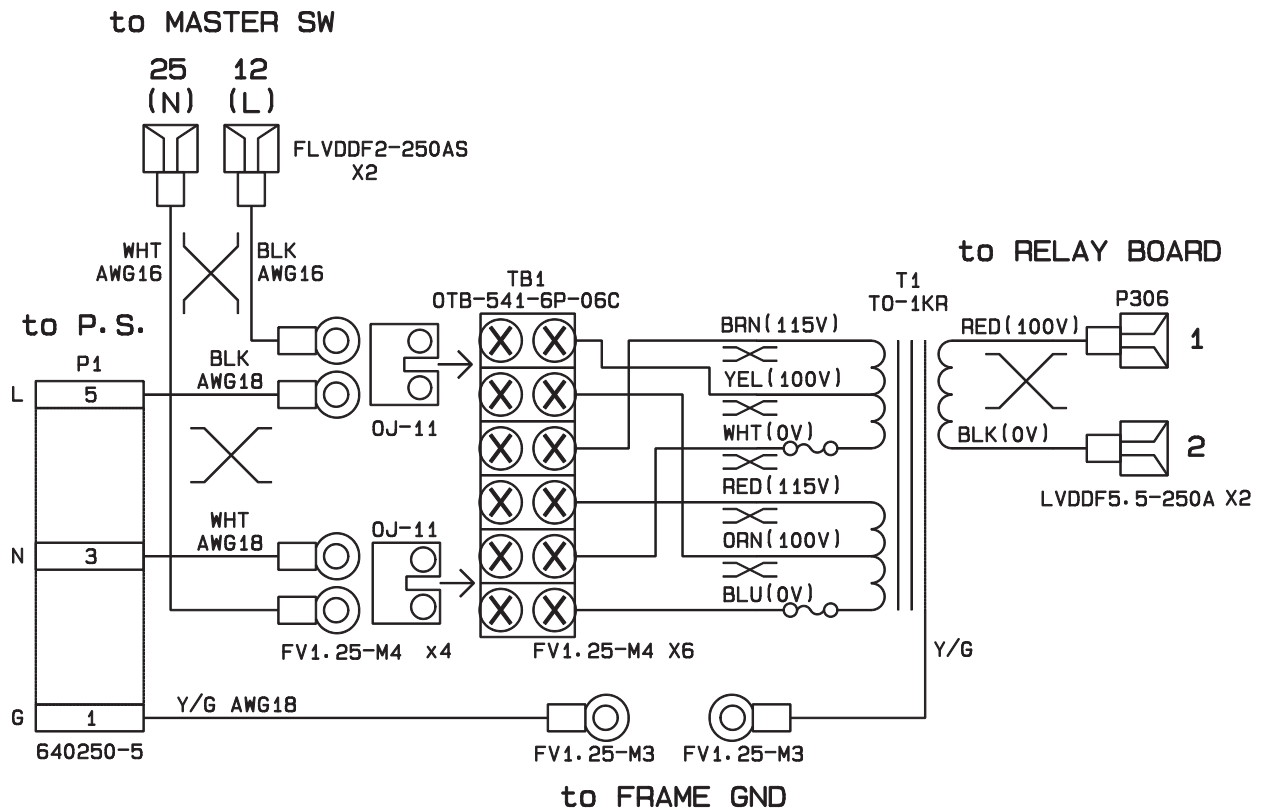
to CB CONNECTOR BOARD



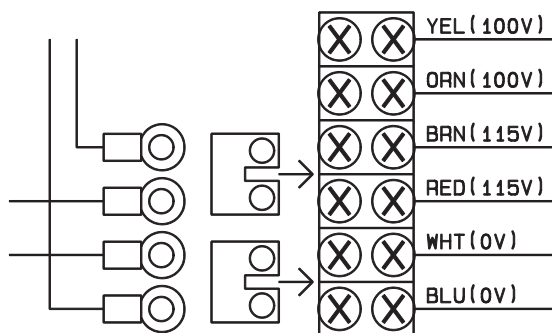


17350-EA33

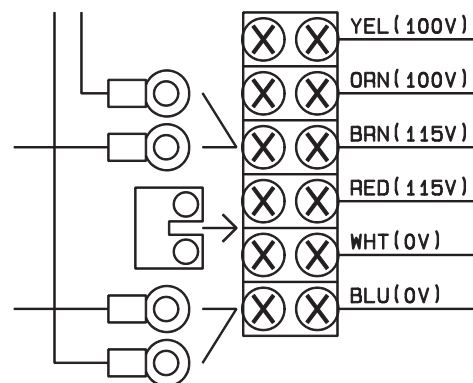
/* INPUT 100V */



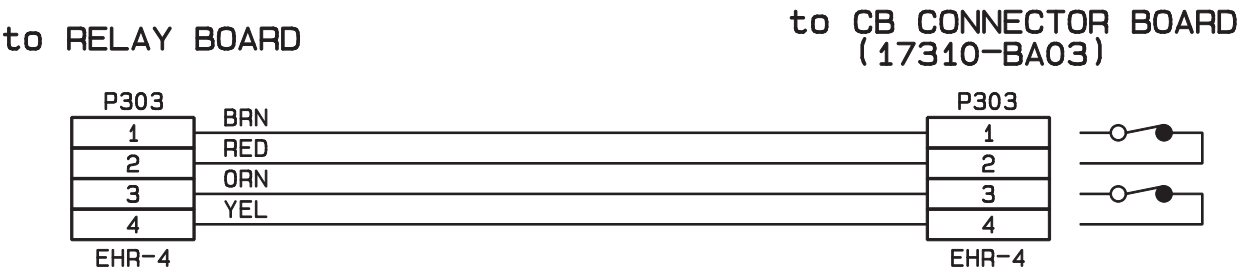
/* INPUT 115V */



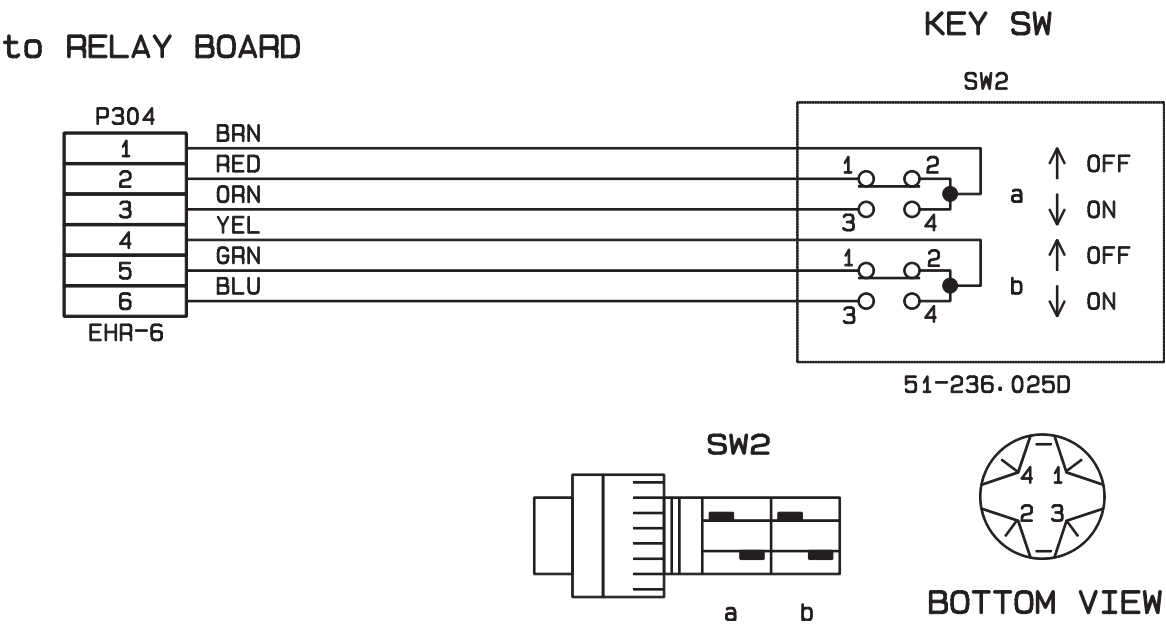
/* INPUT 230V */



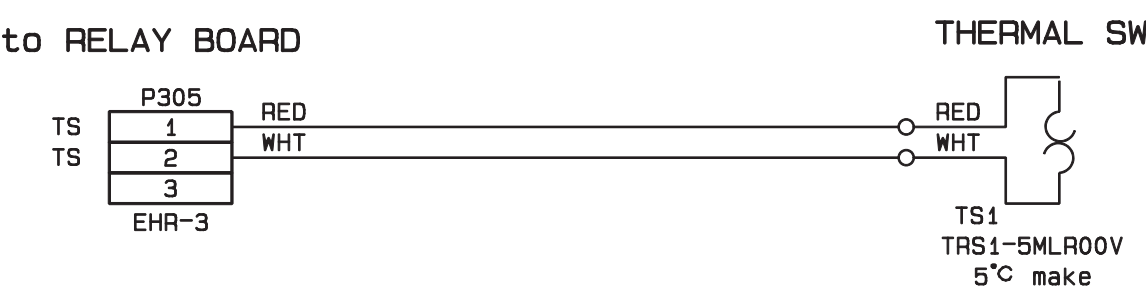
17350-EA34



17350-EA35

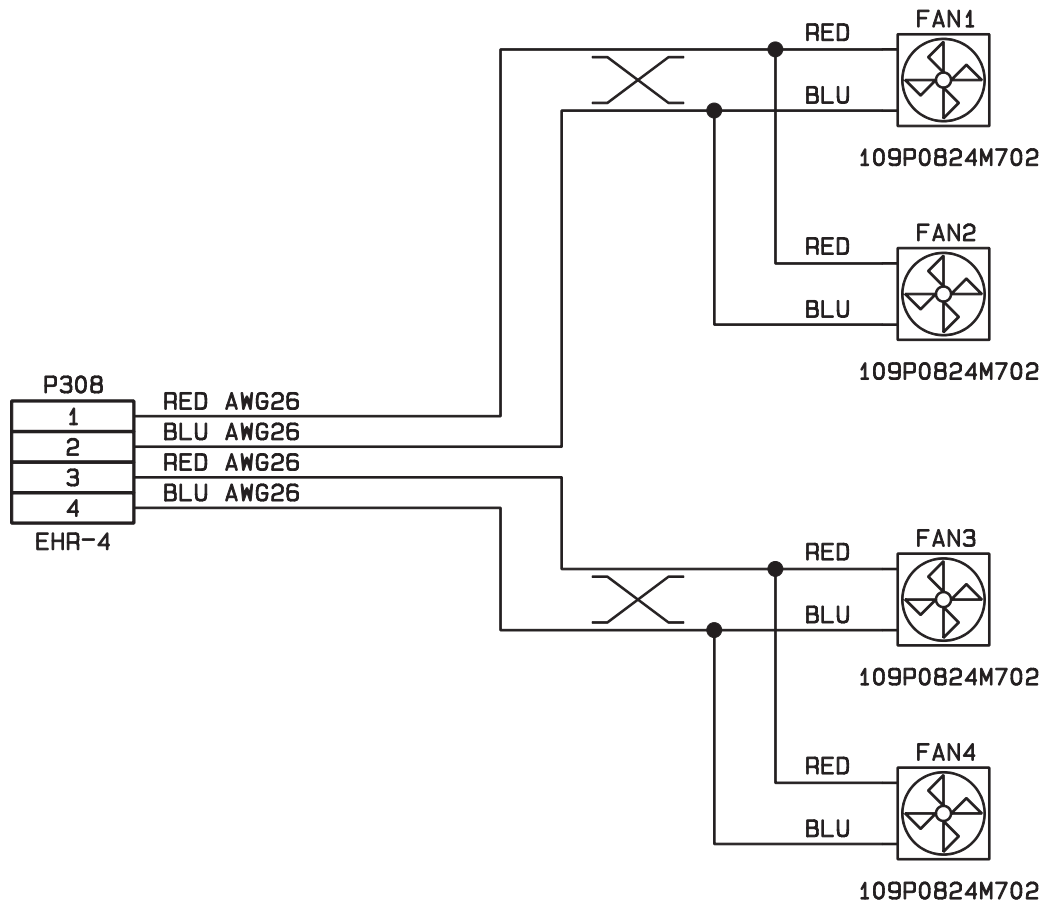


17350-EA36



17350-EA37

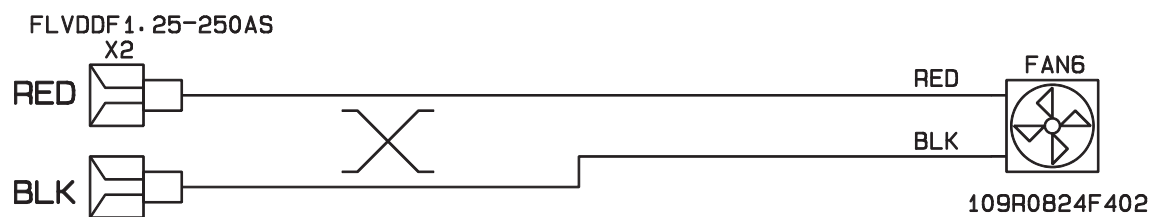
to COMPRESSOR



17350-EA39

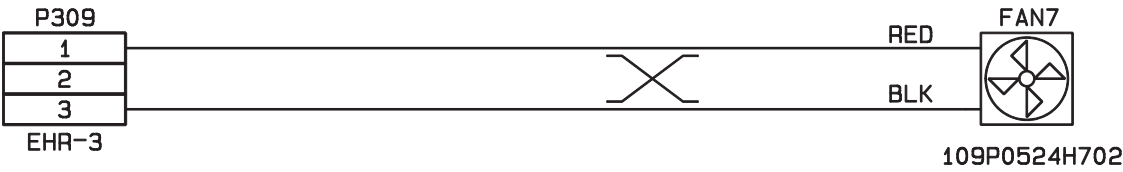
to LD DRIVER
TERMINAL

to LD DRIVER



17350-EA40

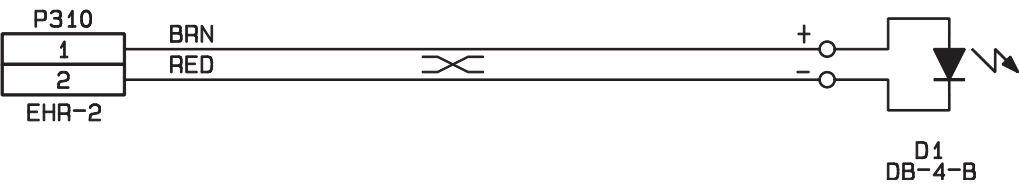
to LD DRIVER



17350-EA41

to RELAY BOARD

LINE INDICATOR



17350-EA42

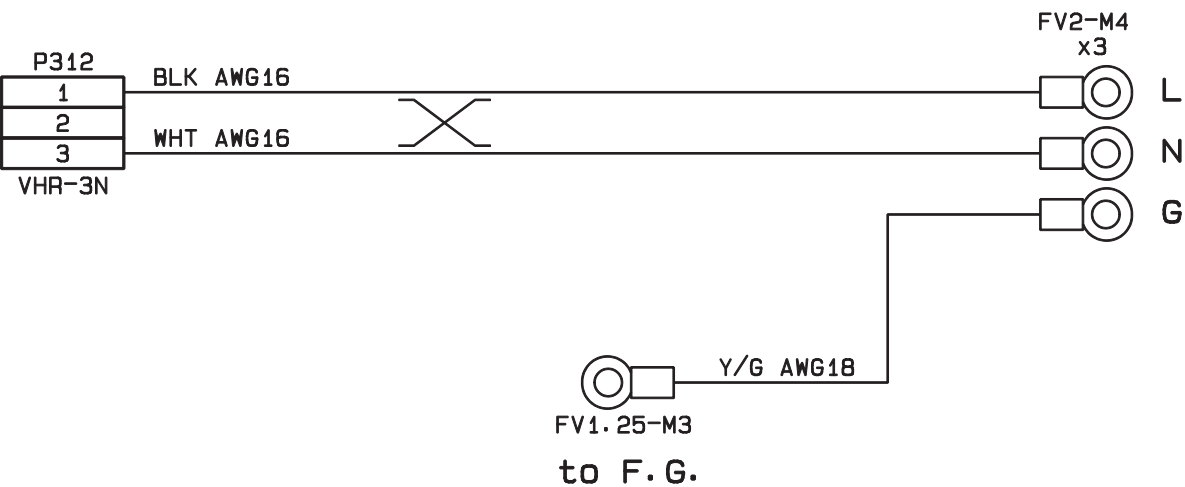
to MASTER BOARD

to RELAY BOARD



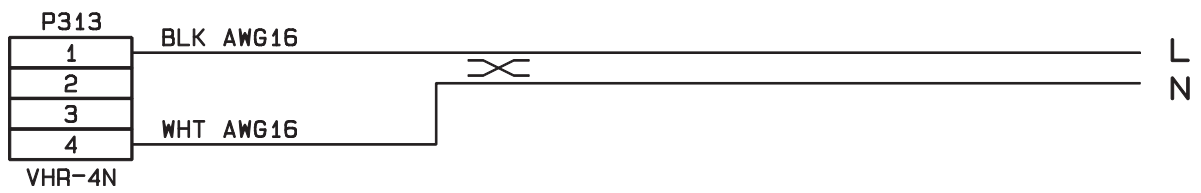
17350-EA43

to COMPRESSOR TERMINAL



17350-EA44

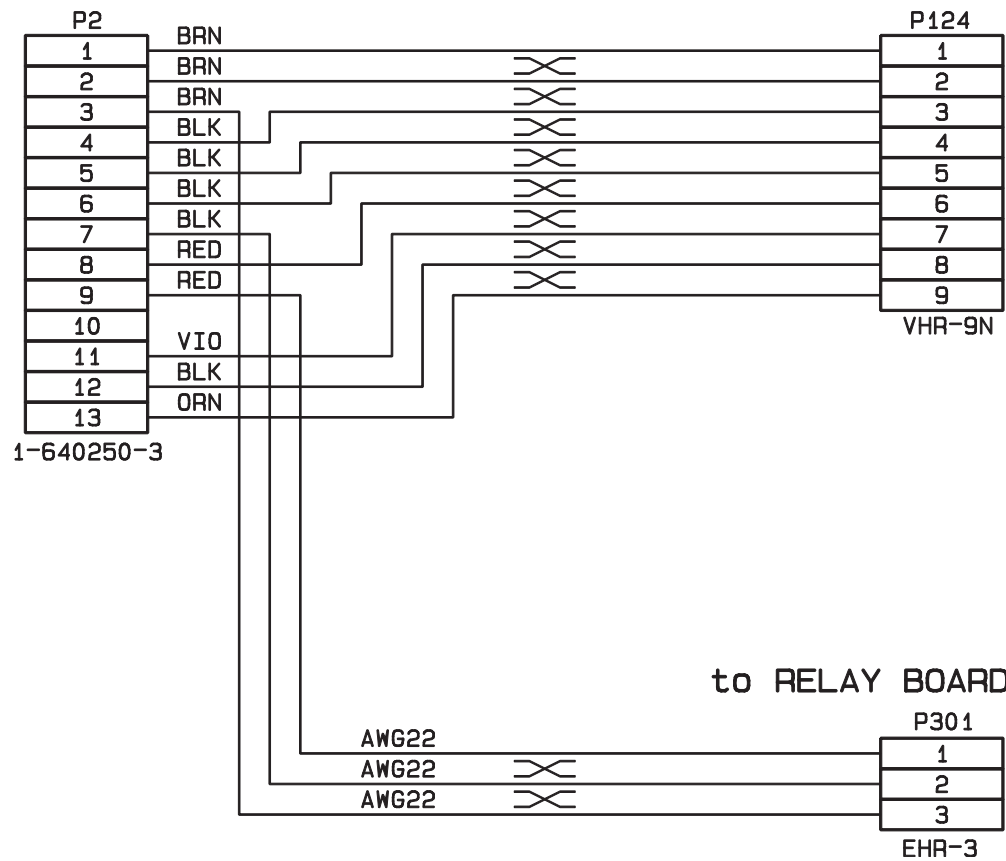
to LD DRIVER TERMINAL



17350-EA45

to POWER SUPPLY

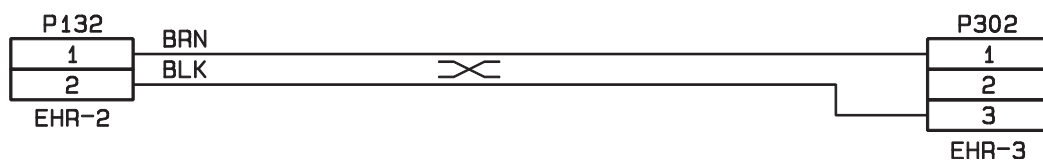
to MASTER BOARD



17350-EA46

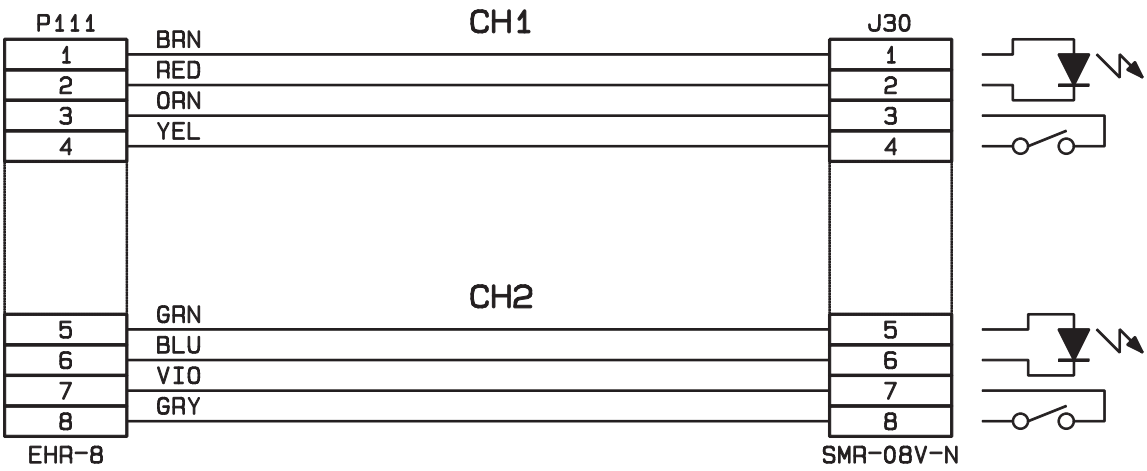
to MASTER BOARD

to RELAY BOARD

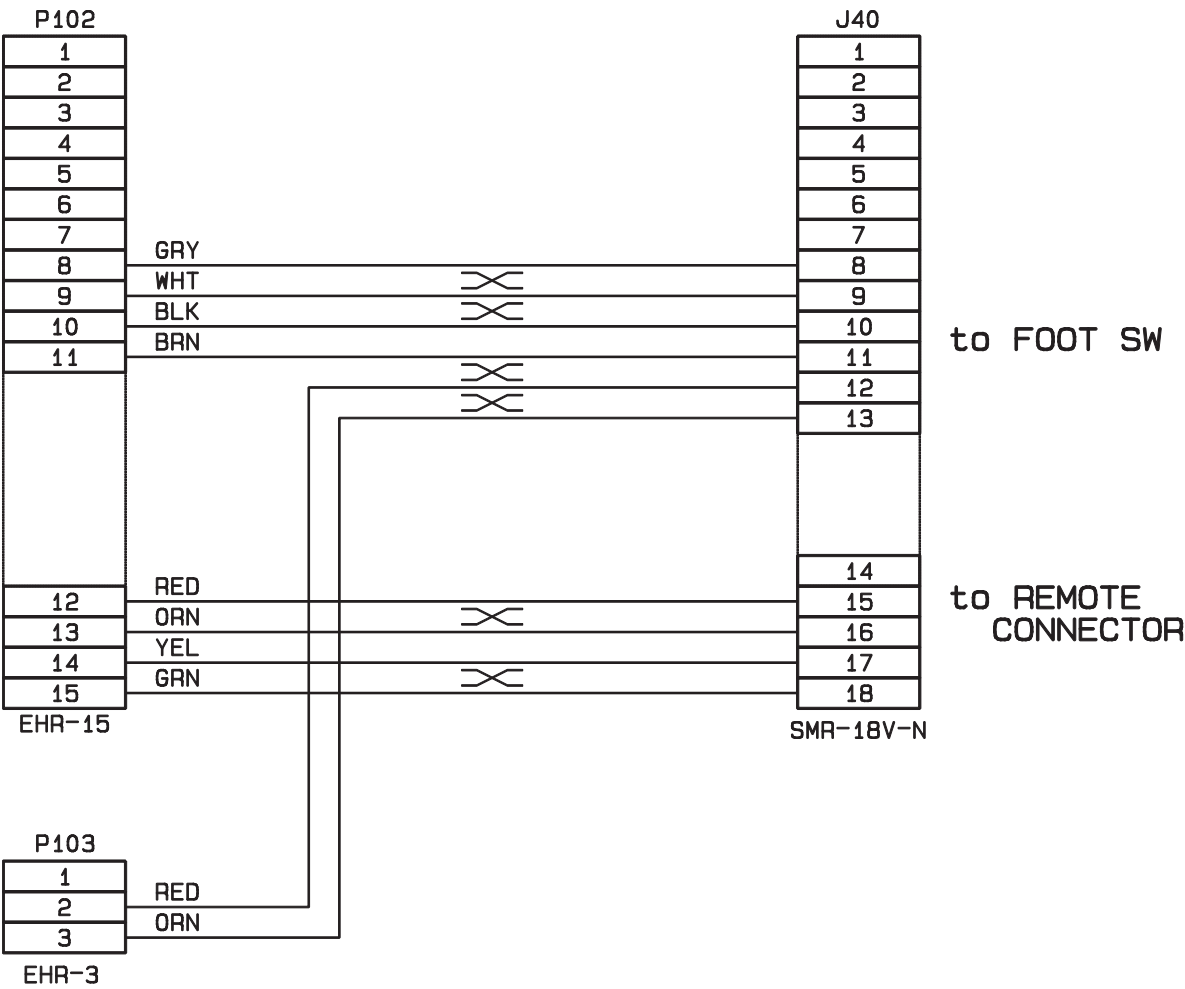


17350-EA47

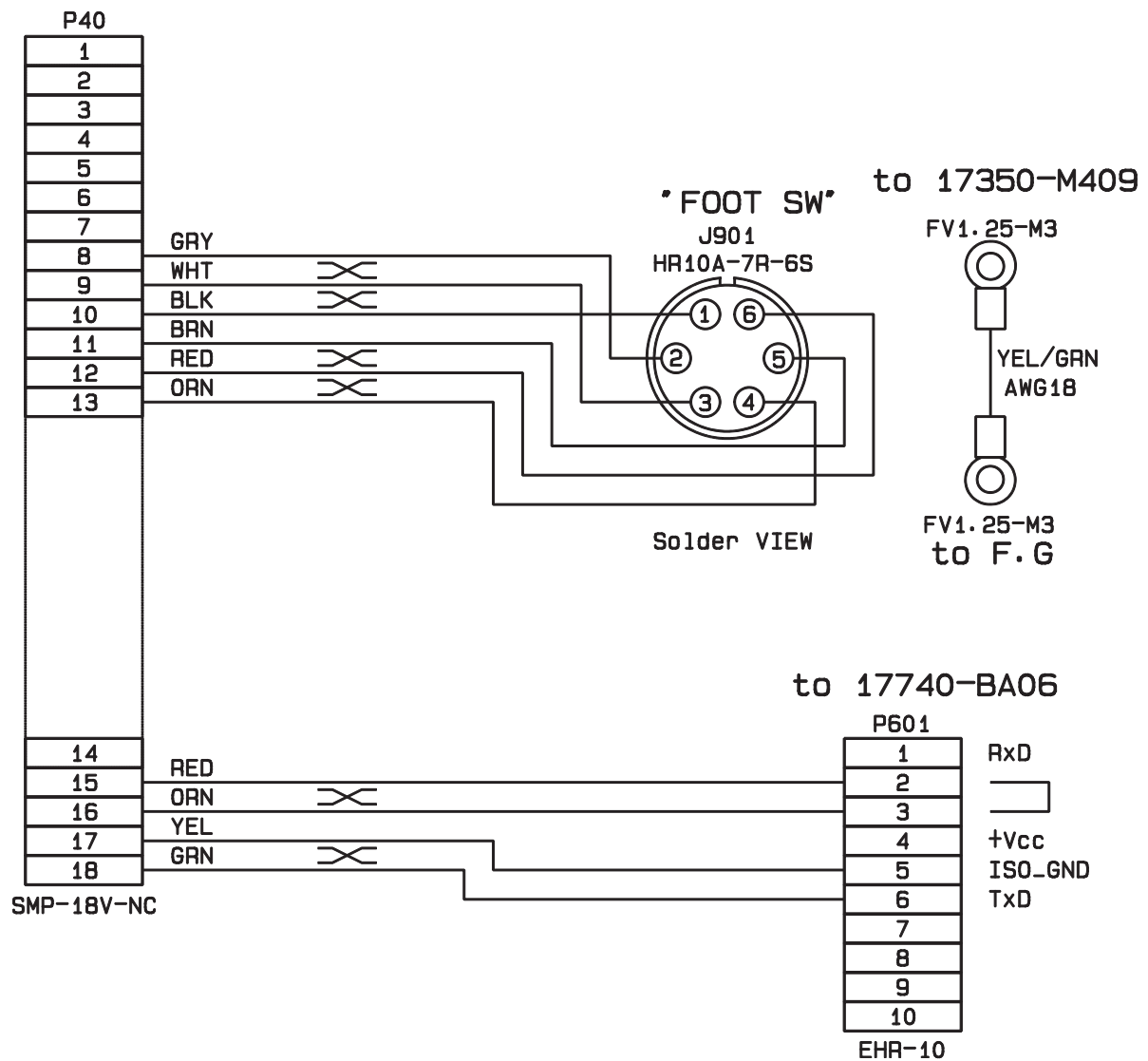
to CHANNEL SELECTOR

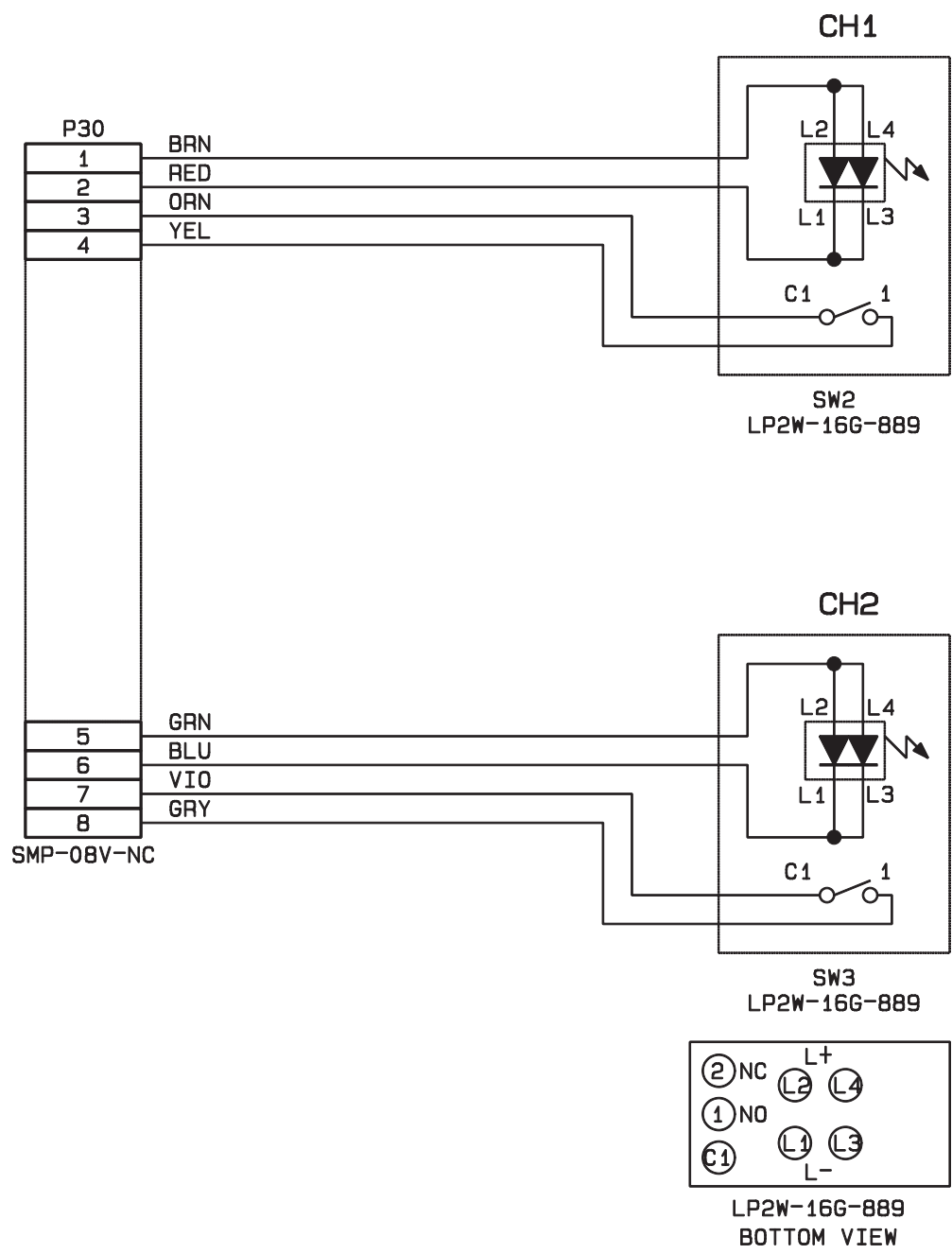


17350-EA48

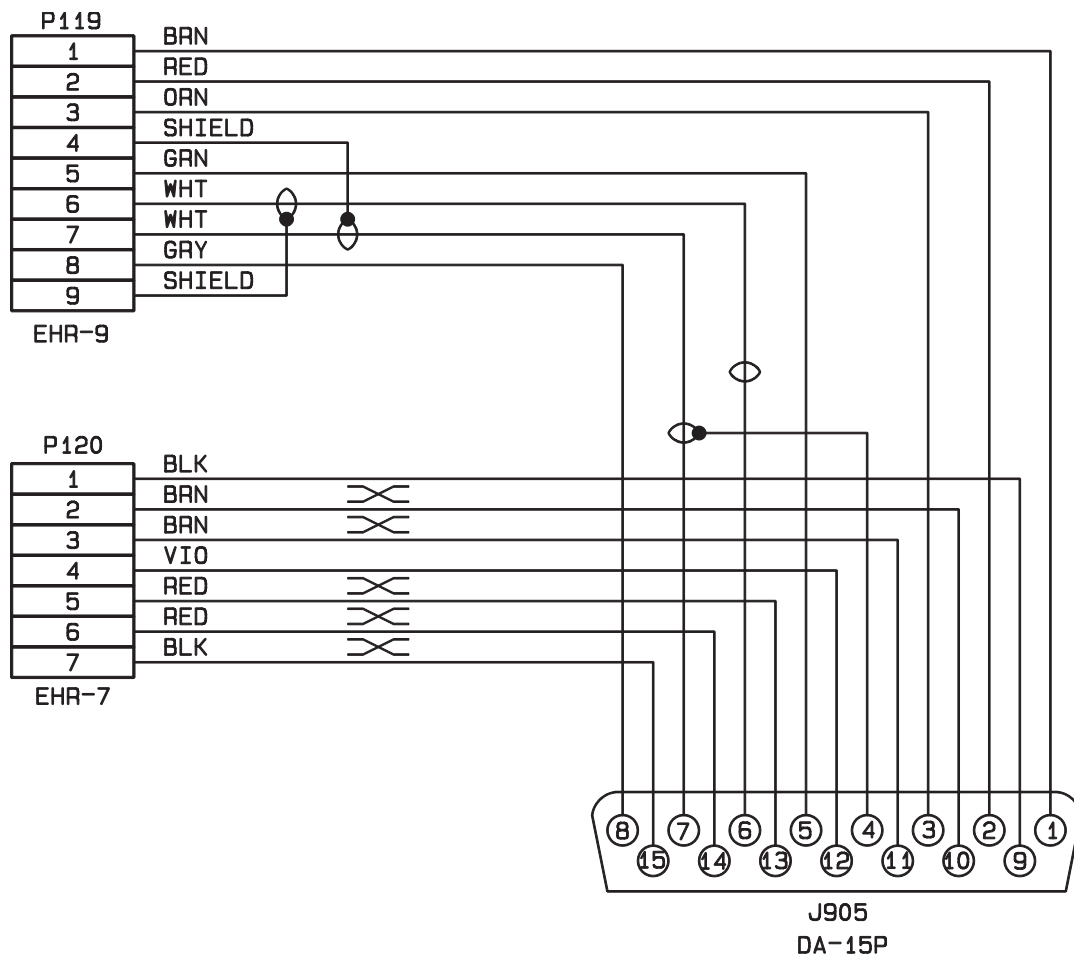


17350-EA49

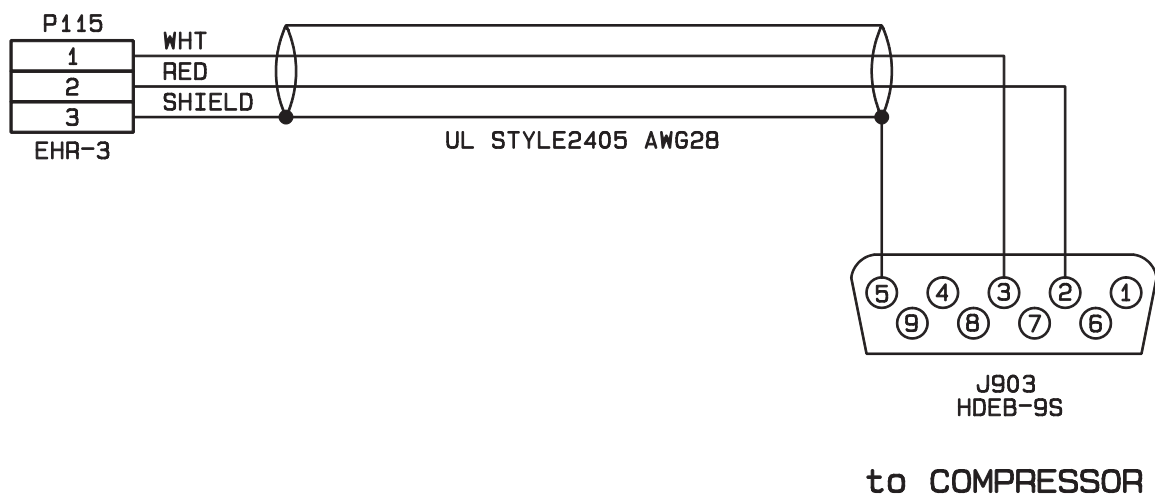




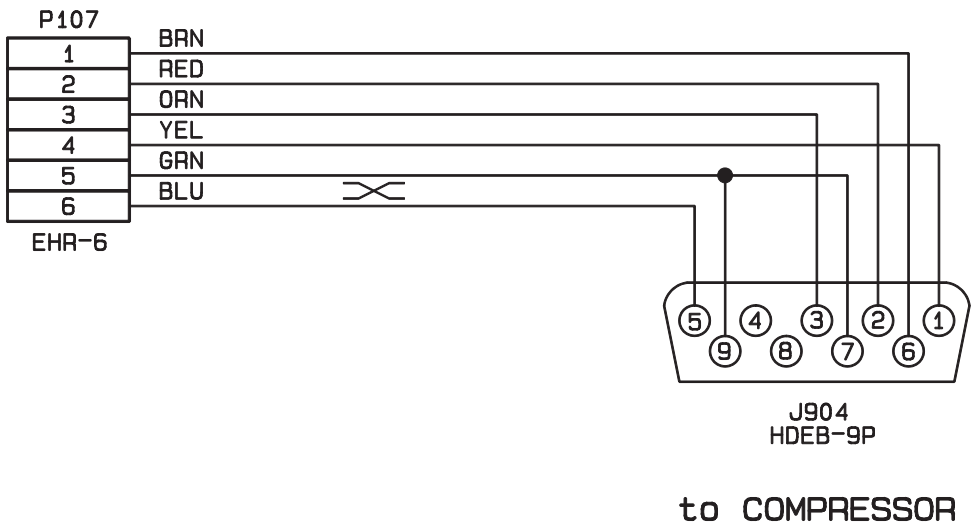
17350-EA50



17350-EA51

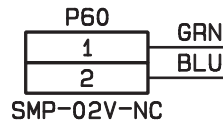
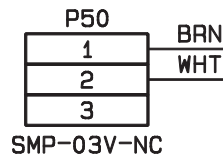


17350-EA52

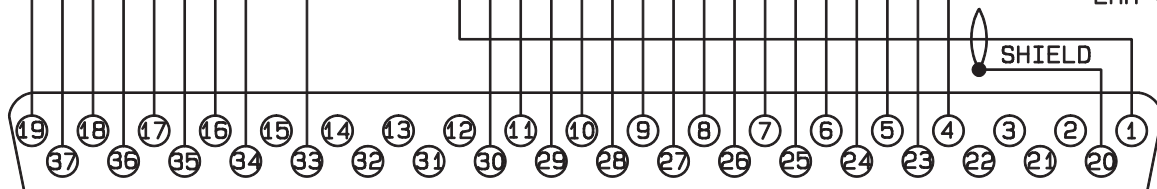
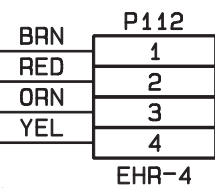
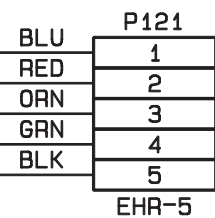
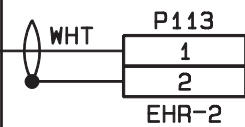


17350-EA53

to MIRROR CONTROL BOARD

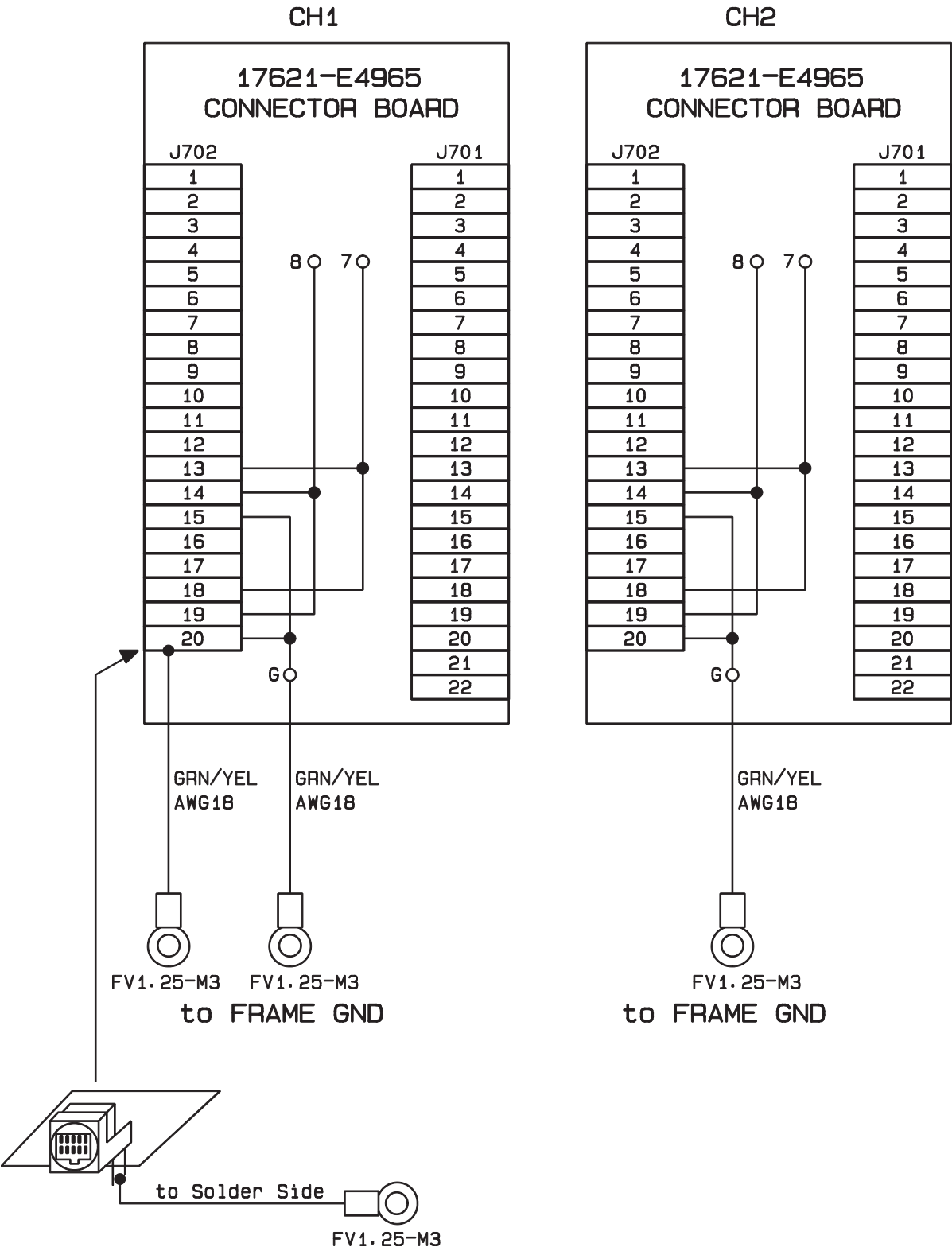


to CRYSTAL CONTROL BOARD

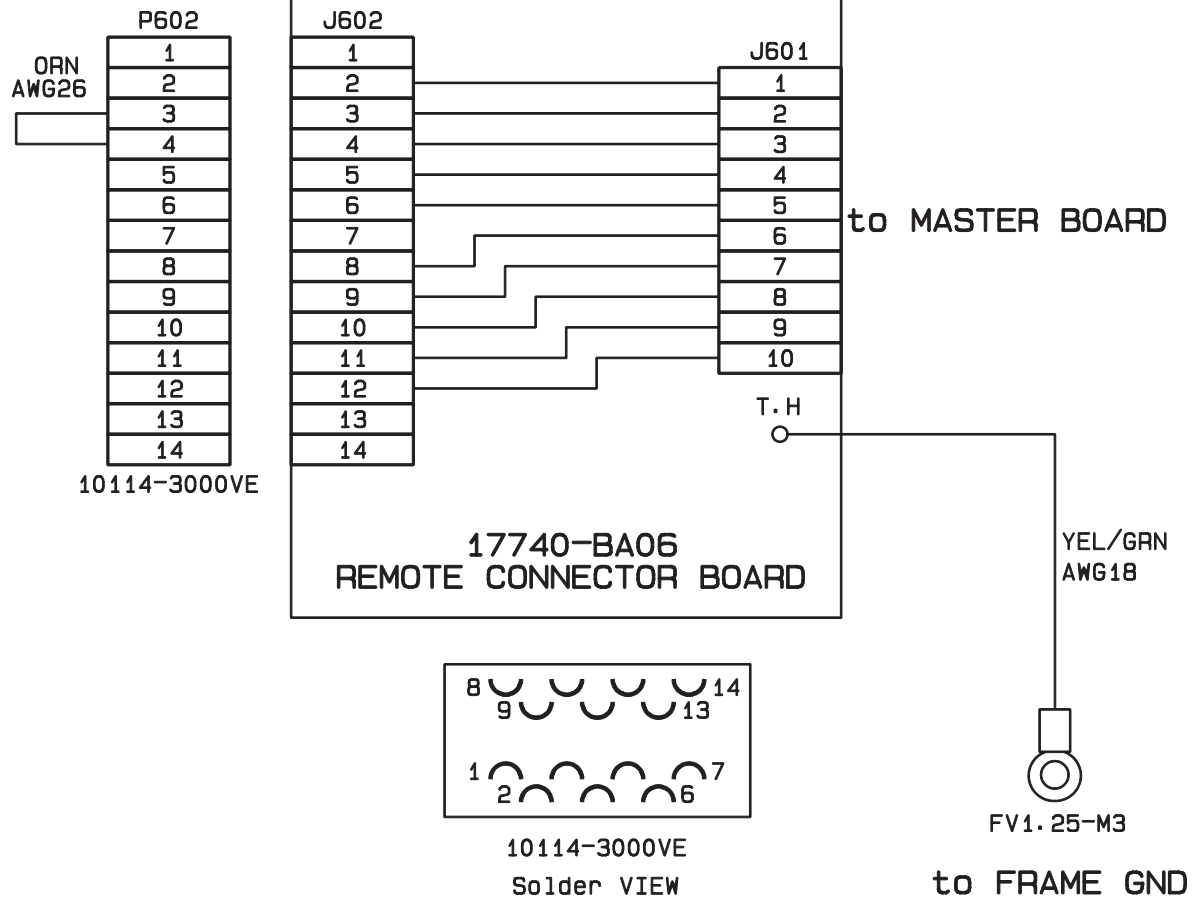
UL STYLE1185
AWG26to
MASTER BOARDP906
HDCB-37S

to LASER HEAD

17350-EA54

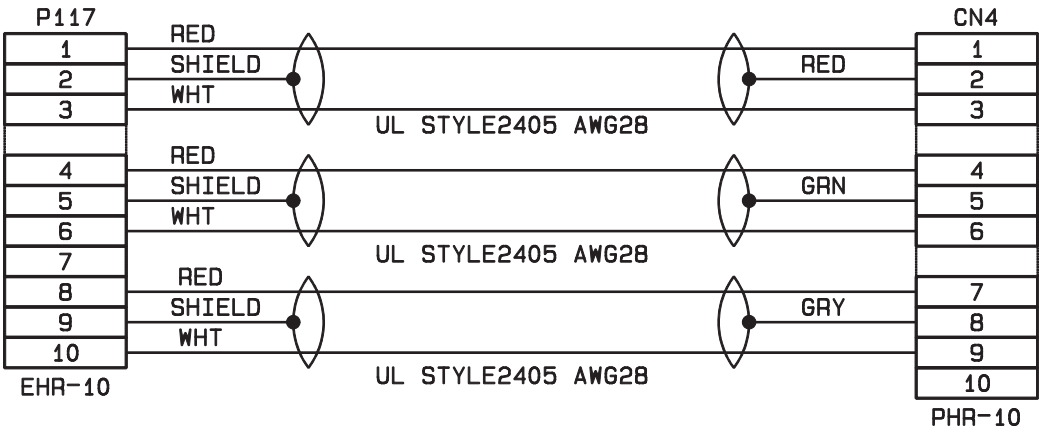
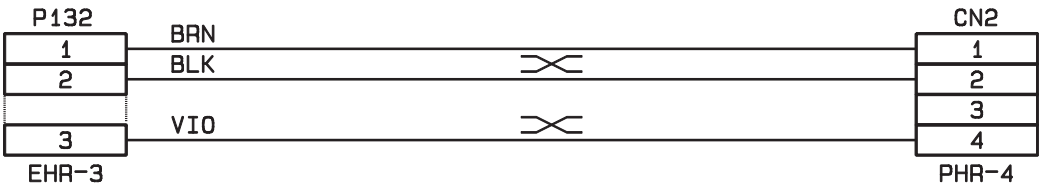
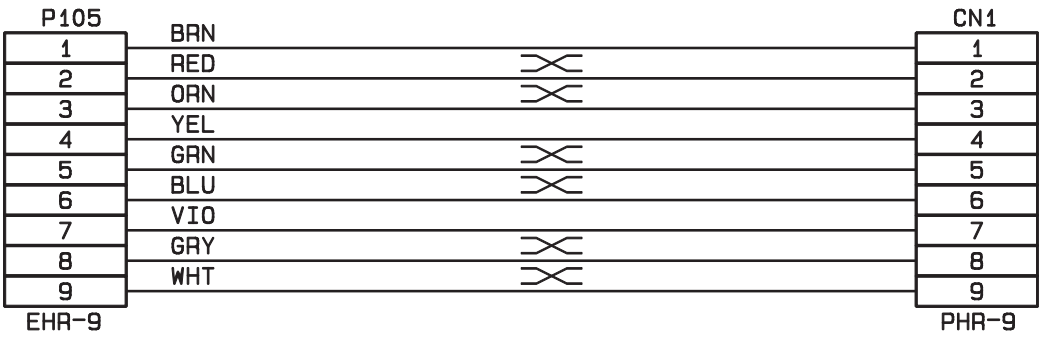
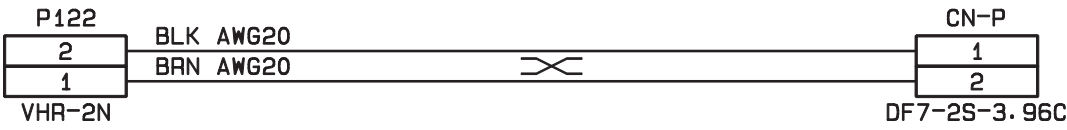


17350-EA55

**REMOTE
CONNECTOR**

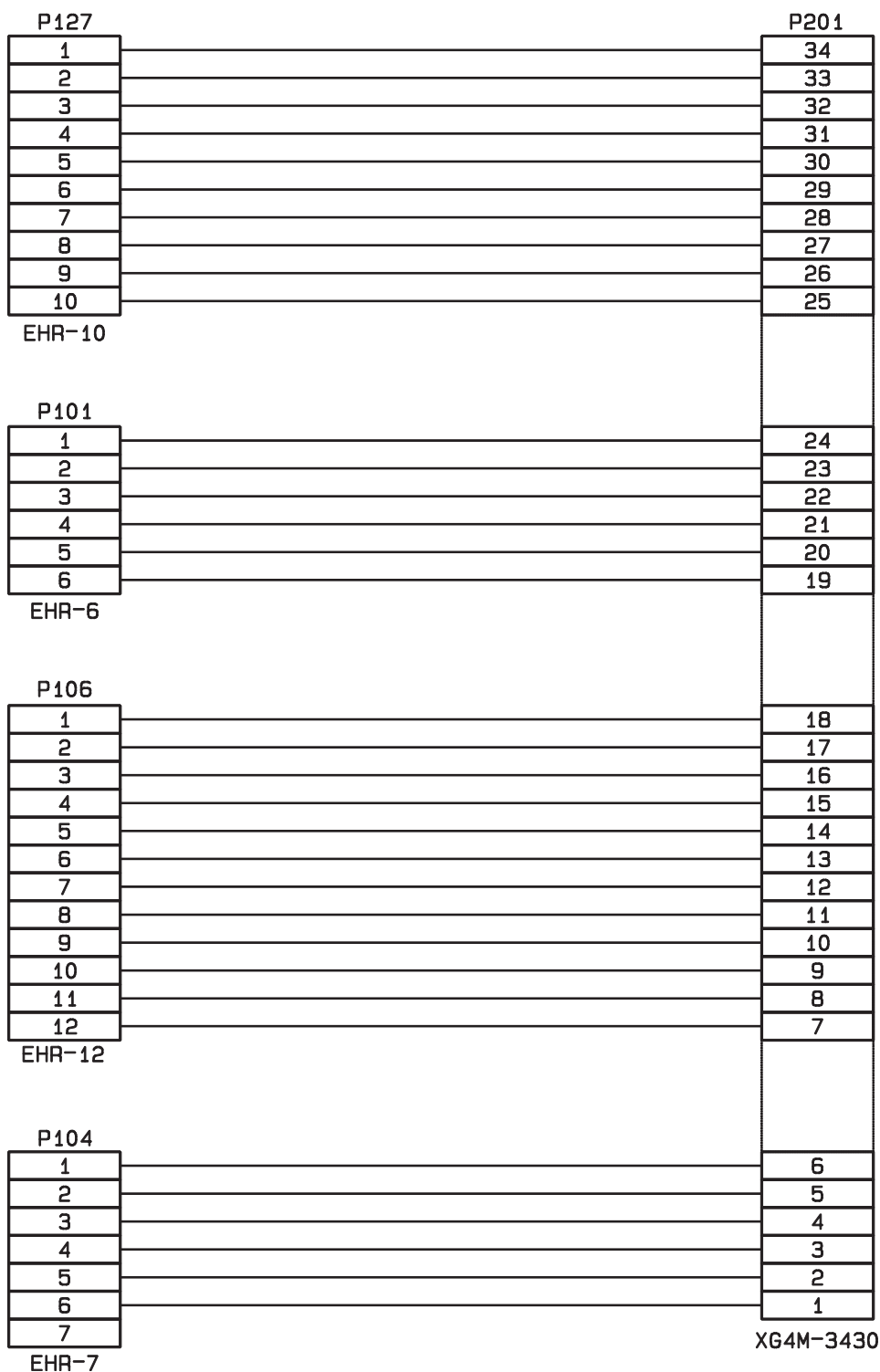
17350-EA56

to PELTIER DRIVER



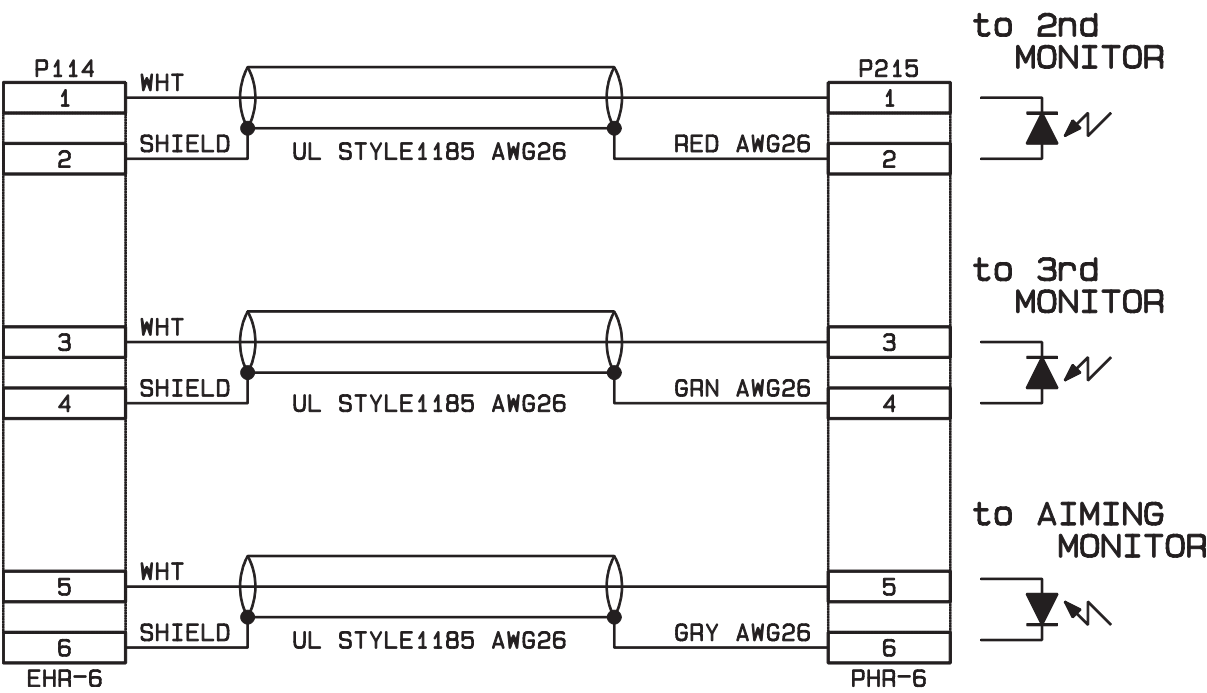
17350-EA57

to INTERFACE BOARD



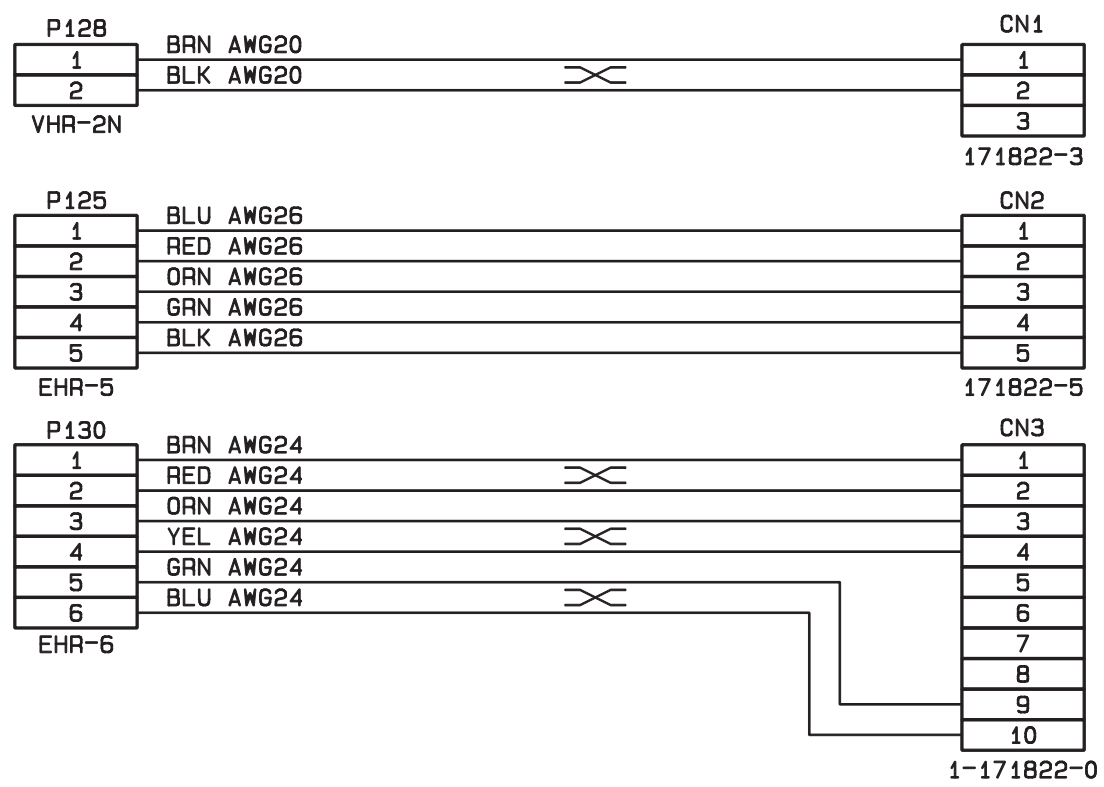
17350-EA58

to INTERFACE BOARD



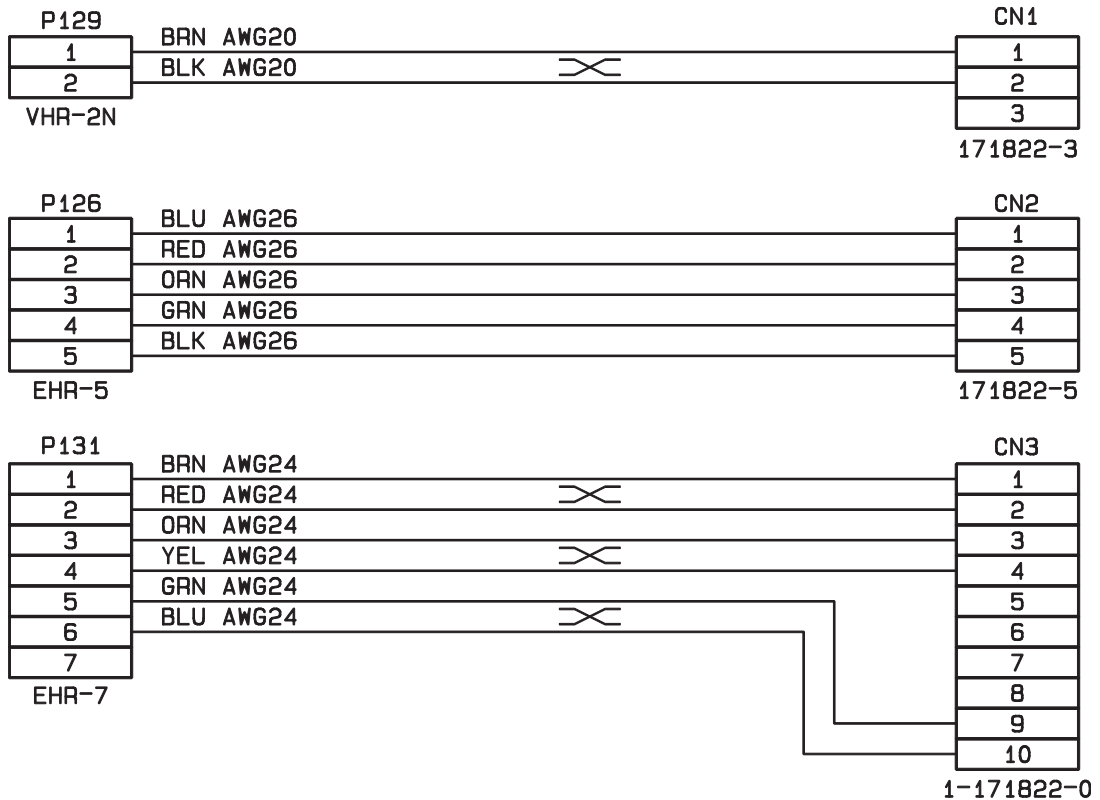
17350-EA59

to COAG MOTOR DRIVER



17350-EA60

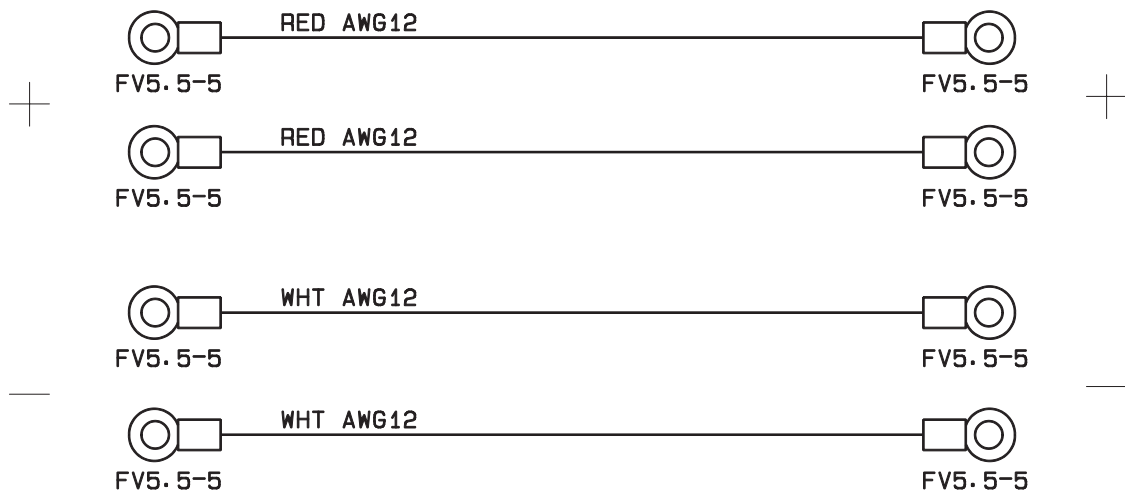
to AIMING MOTOR DRIVER

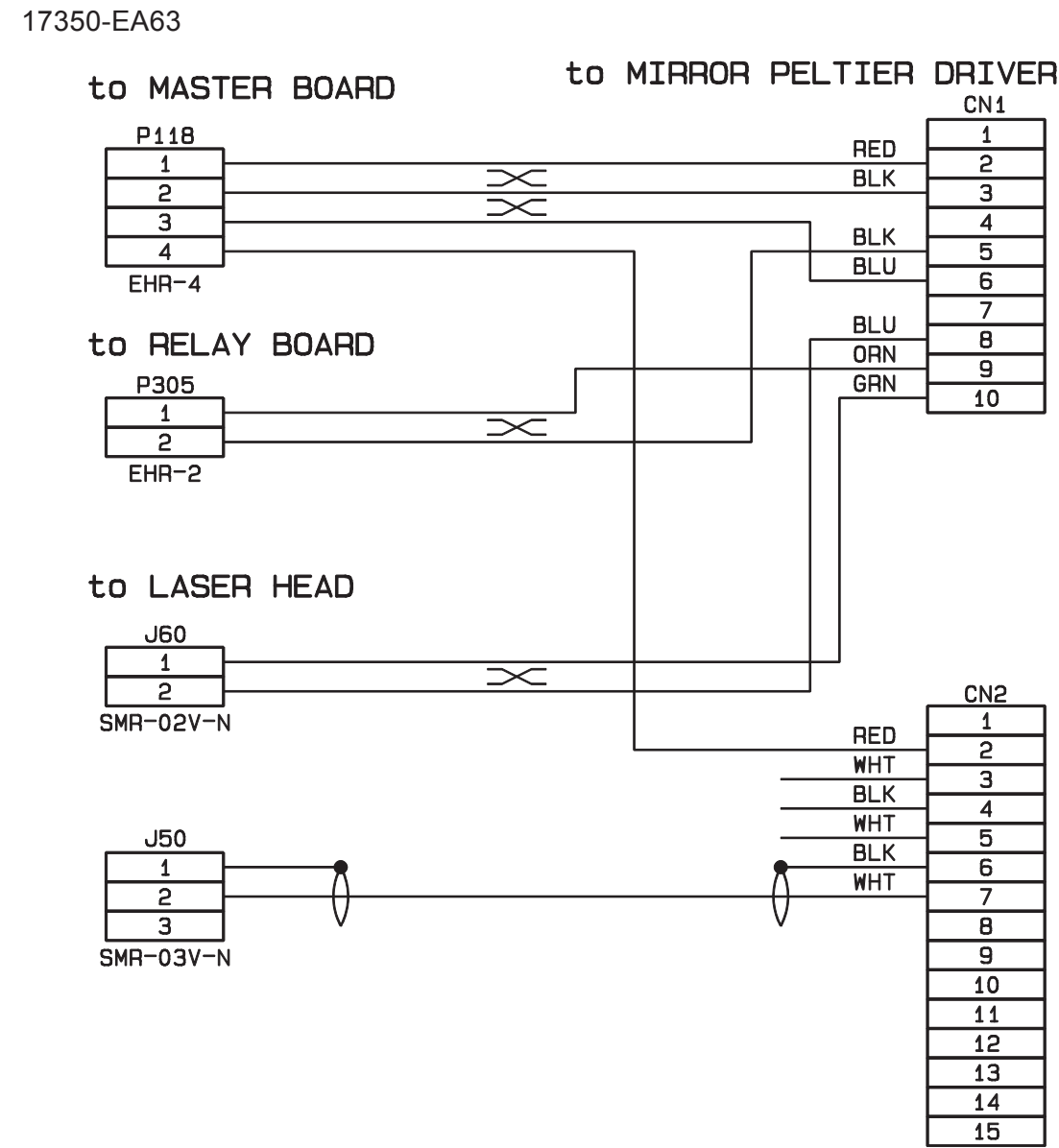
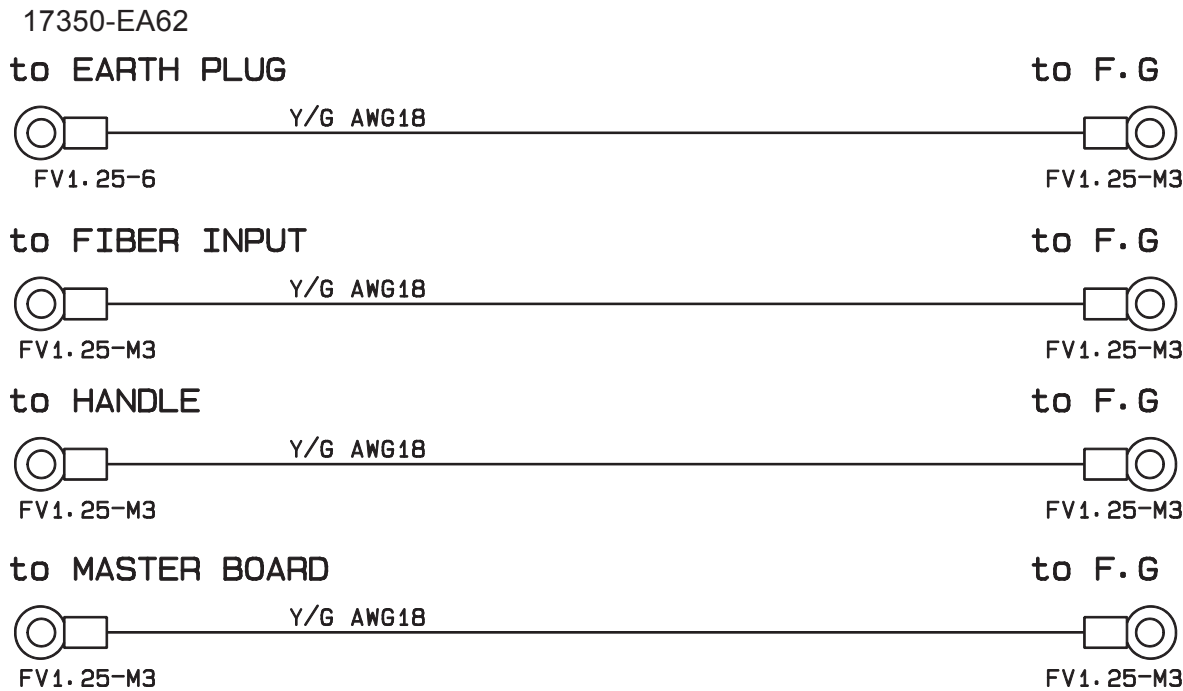


17350-EA61

to LD DRIVER

to LASER HEAD





8.3.2 VR detail table

VR	Item	Details
1	LD aiming gain adjustment (Not used)	Turn VR1 counterclockwise fully.
2	Laser 1 st monitor offset adjustment	Adjust VR2 so that the voltage between TP15 and A_GND is 0 V when the laser is off.
3	1 st monitor GRN output gain adjustment	For the laser head and external power meter: Adjust VR3 so that the actual treatment beam output at the fiber optic cable connector is 3.1 W in the following settings: DIP SW 1 and 2: OFF, Address 69: 00, Address 178: 03, GRN: 510 mW
4	1 st monitor YEL output gain adjustment	For the laser head and external power meter: Adjust VR4 so that the actual treatment beam output at the fiber optic cable connector is 1.08 W in the following settings: DIP SW 1 and 2: OFF, Address 69: 00, Address 178: 03, YEL: 510 mW
5	1 st monitor RED output gain adjustment	For the laser head and external power meter: Adjust VR5 so that the actual treatment beam output at the fiber optic cable connector is 1.08 W in the following settings: DIP SW 1 and 2: OFF, Address 69: 00, Address 178: 03, RED: 510 mW
6	1 st monitor display adjustment (for servicing)	Set DIP SW 8 to the OFF position and press the reset switch. Adjust VR6 so that the d1 p value is the same as the actual output (3100 μ m when the setting is GRN: 510 mW and READY).
7	Current display gain adjustment (for servicing)	Set DIP SW 8 to the OFF position and press the reset switch. Measure the current under the laser diode with the clampmeter when the laser color is RED and aiming is on. Adjust VR7 so that the Ld c value is the same as the measured current.
8	Current display offset adjustment (for servicing)	Set DIP SW 8 to the OFF position and press the reset switch. Adjust VR8 so that the Ld c value is 0 when the aiming is off and the laser color is RED.
9	2 nd monitor GRN output gain adjustment	For gain adjustment of the 2 nd monitor voltage (TP3) and actual output Adjust VR9 so that the TP3 voltage is GRN: 1 V/1 W.
10	2 nd monitor YEL output gain adjustment	For gain adjustment of the 2 nd monitor voltage (TP3) and actual output Adjust VR10 so that the TP3 voltage is YEL: 2 V/1 W.
11	2 nd monitor RED output gain adjustment	For gain adjustment of the 2 nd monitor voltage (TP3) and actual output Adjust VR11 so that the TP3 voltage is RED: 2 V/1 W.
12	2 nd monitor HI offset adjustment	Adjust VR12 so that the TP3 voltage is 0 V when the laser is off.
13	2 nd monitor LO offset adjustment	Adjust VR13 so that the TP1 voltage is 0 V when the laser is off.
14	3 rd monitor GRN output gain adjustment	For gain adjustment of the 3 rd monitor voltage (TP4) and actual output Adjust VR14 so that the TP4 voltage is GRN: 1 V/1 W.
15	3 rd monitor YEL output gain adjustment	For gain adjustment of the 3 rd monitor voltage (TP4) and actual output Adjust VR15 so that the TP4 voltage is YEL: 2 V/1 W.
16	3 rd monitor RED output gain adjustment	For gain adjustment of the 3 rd monitor voltage (TP4) and actual output Adjust VR16 so that the TP4 voltage is RED: 2 V/1 W.
17	3 rd monitor HI offset adjustment	Adjust VR17 so that the TP4 voltage is 0 V when the laser is off.
18	3 rd monitor LO offset adjustment	Adjust VR18 so that the TP2 voltage is 0 V when the laser is off.
19	Excessive aiming beam output detection gain adjustment	Turn VR1 counterclockwise fully.
20	Excessive aiming beam output detection offset adjustment	Adjust VR20 so that the TP20 voltage is 0 V when the aiming is off (about the center).
21	LD excessive voltage level adjustment	Not used. Turn VR1 clockwise fully.

8.3.3 TP detail table

TP	Item	Details
1	2 nd monitor LO (monitor for low output)	GRN: 1 V/ 1W (VR9), YEL: 1 V/0.5 W (VR10), RED: 1 V/0.5 W (VR11) OFFSET: VR13
2	3 rd monitor LO (monitor for low output)	GRN: 1 V/1 W (VR14), YEL: 1 V/0.5 W (VR15), RED: 1 V/0.5 W (VR16) OFFSET: VR18
3	2 nd monitor HI (monitor for high output)	GRN: 1 V/1 W (VR9), YEL: 1 V/0.5 W (VR10), RED: 1 V/0.5 W (VR11) OFFSET: VR12
4	3 rd monitor HI (monitor for high output)	GRN: 1 V/1 W (VR14), YEL: 1 V/0.5 W (VR15), RED: 1 V/0.5 W (VR16) OFFSET: VR17
5	--	Not used
6	LD aiming monitor	1 V or less when the aiming output is maximum
7	Spot size voltage	Adjust the potentiometer and VR inside the delivery unit so that the voltage is 0.1 V in the spot size of 50 μ m and 3 V in the spot size of 500 μ m.
8	--	Not used
9	LD (635 nm) current monitor for the BIO aiming	Measure the voltage after LD AIM output adjustment. When the voltage is 1 V or more, perform alignment again. Voltage (V) $\div$ 30 = Current (A) (used in 1 V or less)
10	Main laser LD current	1 V/10 A: VR7 = GAIN and VR8 = OFFSET
11	1 st monitor (inside the laser head)	In the output control motor 100% position, adjust the output (external powermeter) and voltage after the laser is transmitted to the shutter unit. Adjust GRN: 1 V/1 W, YEL: 1 V/0.5 W, RED: 1 V/0.5 W with VR6.
12	--	Not used
13	Protective filter sensor 1	Protective filter – IN: 0 V. OUT: 4 to 5 V
14	Protective filter sensor 2	Protective filter – IN: 4 to 5 V, OUT: 0 V
15	1 st monitor (inside the laser head) for check	Actually not used.
16	Laser diode current limit	Set 10 V/30 A with the parameters (GRN: Address 170, YEL: Address 171, RED: Address 172) (Example: 250 = 25 A = 8.3 V)
17	Modulating signal	In current control: 10 V/30 A when each color setting is maximum. (ex.GRN: 1000 mW = 5 V = 15 A) In light control: GRN: twice of the setting output, YEL&RED: four times (ex.GRN: 3.1 W = 6.2 V)
18	--	
19	Current control signal	Check that the TP19 voltage is the same as that of TP10. If not, the wiring or LD power supply is failed.
20	LD aiming monitor	1 V or less when the aiming output is maximum
21	Calibration	Not used
22	Red laser crystal setting temperature	1 V = 10 $^{\circ}$ C (Example: 4.3 V = 43 $^{\circ}$ C)
23	Yellow laser crystal setting temperature	1 V = 10 $^{\circ}$ C (Example: 4.3 V = 43 $^{\circ}$ C)
24	Green laser crystal setting temperature	1 V = 10 $^{\circ}$ C (Example: 4.3 V = 43 $^{\circ}$ C)
25	Red laser crystal actual temperature	1 V = 10 $^{\circ}$ C (Example: 4.3 V = 43 $^{\circ}$ C)
26	Yellow laser crystal actual temperature	1 V = 10 $^{\circ}$ C (Example: 4.3 V = 43 $^{\circ}$ C)
27	Green laser crystal actual temperature	1 V = 10 $^{\circ}$ C (Example: 4.3 V = 43 $^{\circ}$ C)
28	Current control signal	Electrically isolated control signal, 10 V/30 A
29	--	Not used
30	--	Not used
31	--	Not used

8.4 Message Tables

8.4.1 Interlock

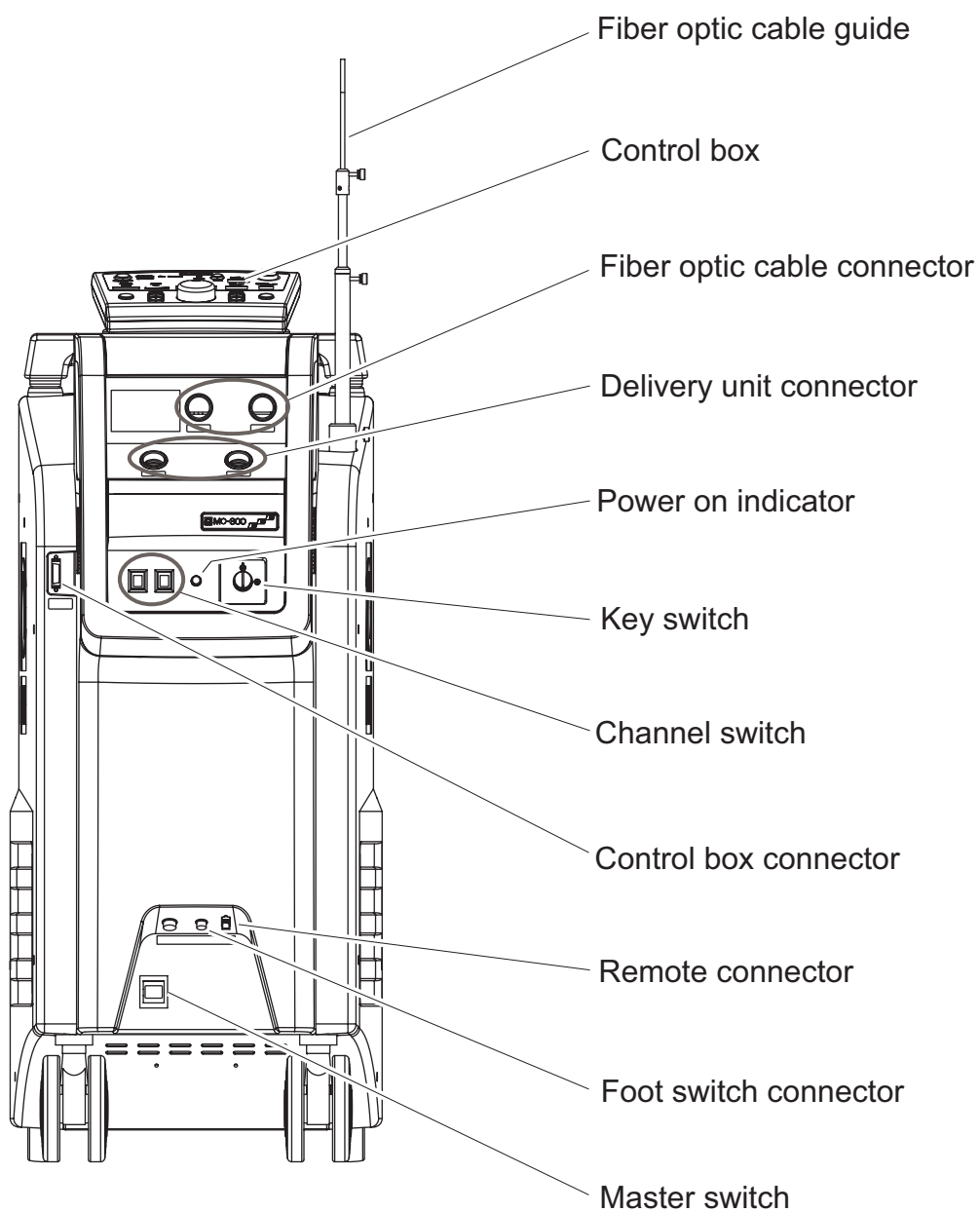
Display	Details
In. 1.6	Overheat of the laser power supply
In. 2.7	Excessive output of the laser beam (The current limit is reached.)
In. 2.8	Excessive output of the laser beam (The current limit is not reached.)
In. 3.2	Cooling device temperature control failure
In. 3.5	Overheat of the cooling device for the compressor
In. 4.5	Insufficient flow amount of the cooling water
In. 5.1	Excessive output of the aiming beam
In. 6.3	Poor connection of the remote interlock connector
In. 9.9	WDT (watchdog timer) error between SUB and MASTER

8.4.2 Error

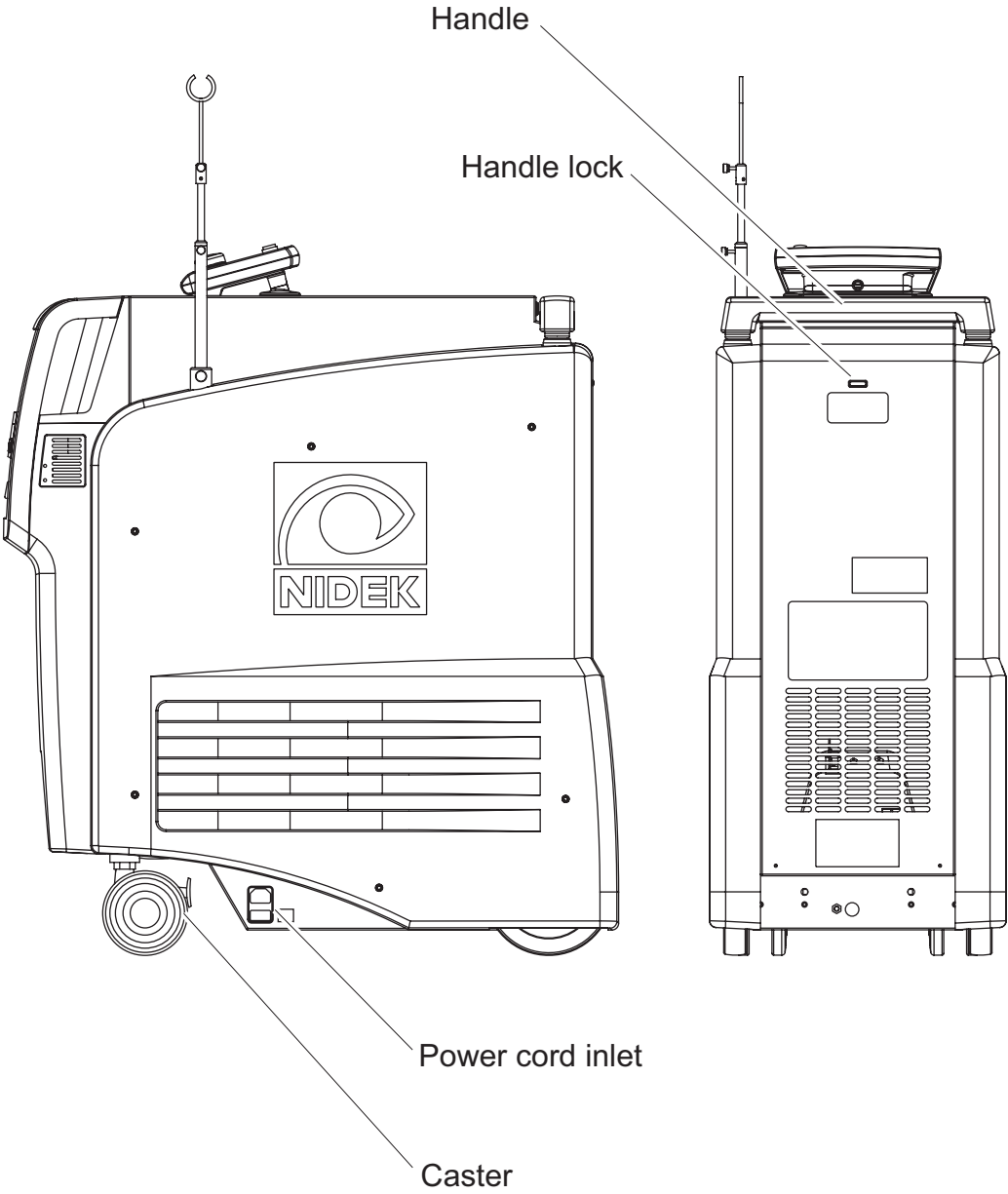
Display	Details
Err 1	Coagulation shutter malfunction
Err 3	Safety shutter malfunction
Err 6	Mirror switchover failure
Err 7	Channel switchover failure
Err 10	Laser malfunction
Err 11	Laser off failure: The current is not 0 A and the output is not 0 mW although the laser is off.
Err 13	Reduction in the output of the laser head 1 st monitor: The current is lower than the current limit.
Err 15	Reduction in the output of the laser: The current reaches the current limit.
Err 18	Laser current limit control failure
Err 25	Mirror switchover motor initial error
Err 26	Output motor initial error
Err 27	Aiming motor initial error
Err 33	Cooling device water level failure
Err 34	Cooling device starting time over
Err 53	Trigger switch malfunction
Err 54	CH1 fiber switch malfunction
Err 55	CH2 fiber switch malfunction
Err 59	NLO temperature control failure
Err 80	DPRAM timeout: MASTER (IC1)
Err 81	DPRAM timeout: SUB (IC23)
Err 82	DPRAM data failure: MASTER (IC1)
Err 83	DPRAM data failure: SUB (IC23)
Err 90	Program data failure
Err 91	EEPROM data failure
Err 93	Data failure
Err 94	CPU operation failure

8.5 Appearance

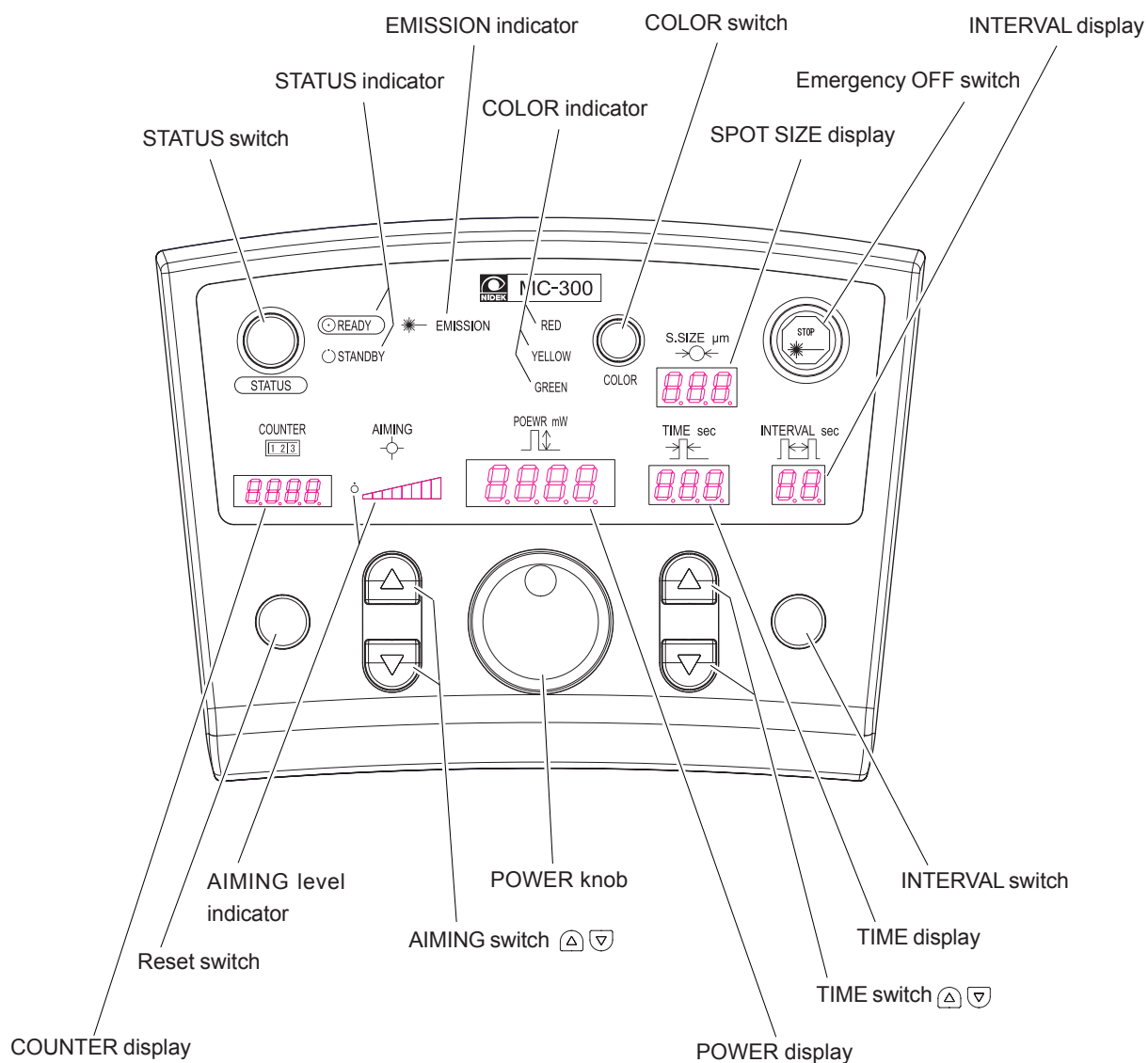
8.5.1 Front view



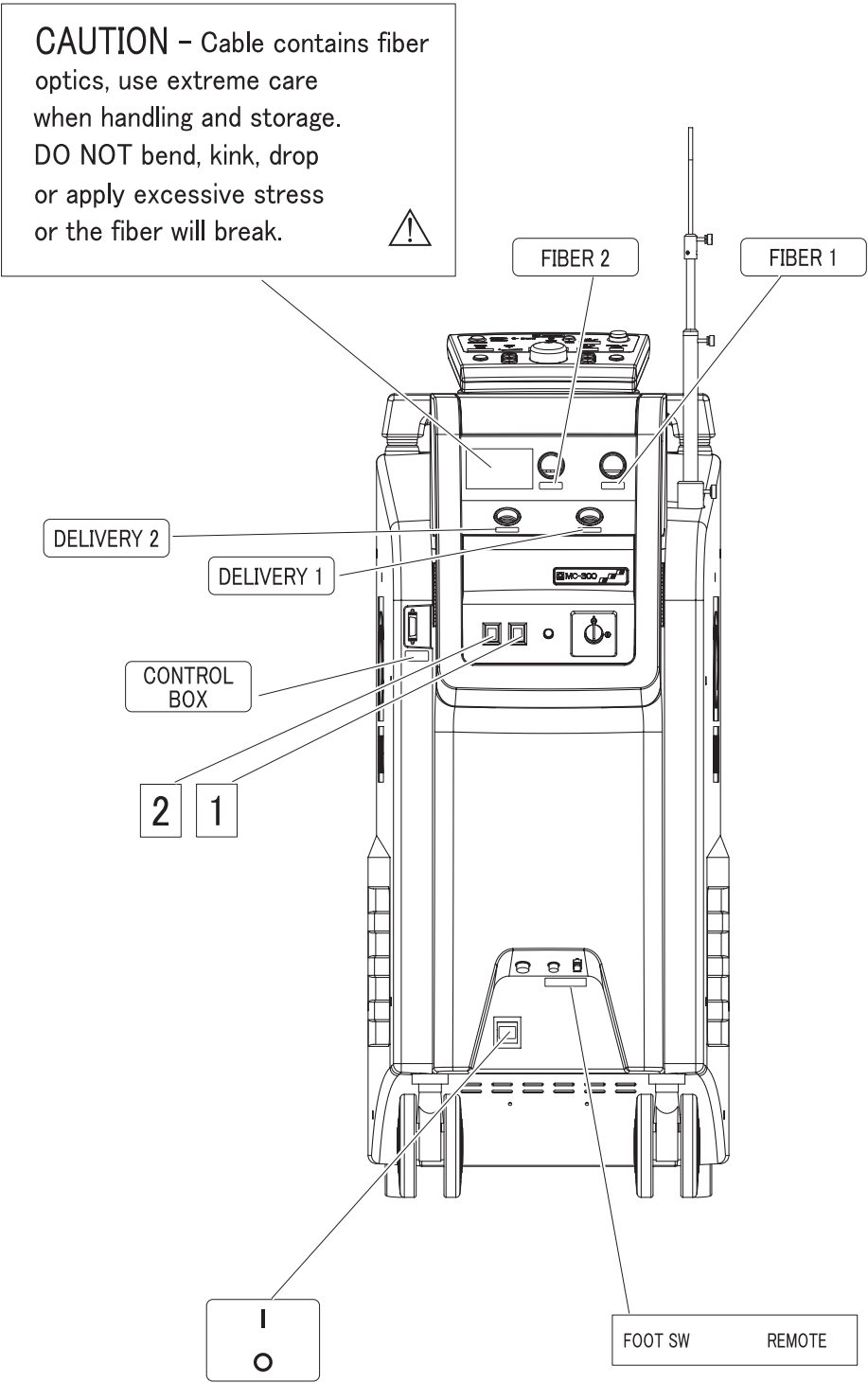
8.5.2 Side and rear view

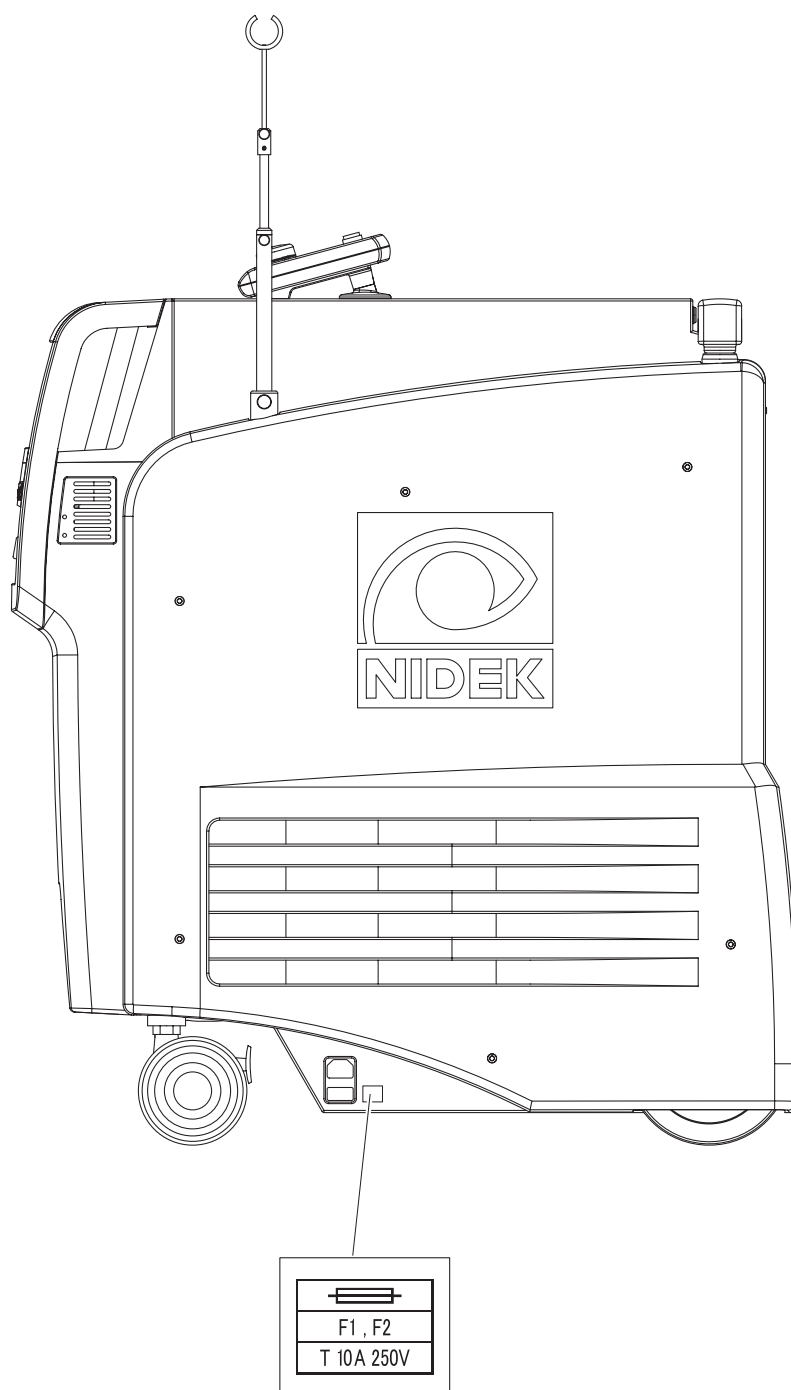


8.5.3 Control box



8.6 Labels





PRESS TO RELEASE HANDLE-LOCK

CAUTION

FINGERS MAY BE PINCHED
WHEN RELEASING HANDLE-LOCK

USE PURE WATER OR
DISTILLED WATER

LIQUIDE DE REFROIDISSEMENT
EAU DISTILLEE

WARNING – system contains a
water tank. **DO NOT** store or
transport unit in temperatures
below 32°F (0°C) or freezing
and damage will occur.



MULTICOLOR LASER PHOTOCOAGULATOR SYSTEM	
MODEL	MC-300
SERIAL	
DATE	
INPUT	V~, 50/60Hz, 1000VA
	
Manufacturer: NIDEK CO., LTD. 34-14 MAEHAMA HIROISHI-2ND CHAMBERI AICHI JAPAN MADE IN JAPAN	

LASER RADIATION	
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION CLASS 4 LASER PRODUCT	
DPSS LASER	532/561/659nm CW, 10Wmax.
DIODE LASER	635nm CW, 3mWmax.
IEC 60825-1 1997	

DANGER Avoid eye or skin exposure to direct or scattered radiation.
DANGER Risk of explosion if used in the presence of flammable anesthetics.
WARNING Risk of fire.
Replace fuse as marked.
CAUTION To reduce the risk of electric shock, do not remove cover.
Refer servicing to qualified service personnel.



フロン回収破壊法 第一種特定製品(冷凍機)

- 1) フロン類をみだりに大気中に放出することは禁じられています。
Intentional release of HFCs into the air is prohibited.
Les emissions intentionnelle des HFC dans l'air sont interdites.
- 2) この製品を廃棄する場合には、フロン類の回収が必要です。
When disposing of this product, recovery of HFCs is required.
En mettant ce produit au rebut, les recuperations des HFC sont obligatoires.
- 3) 冷媒の種類及び数量
Type and amount of refrigerants / Type et quantite des refrigerants

種類/Type	冷媒番号/No.	数量 [g]
HFC	R134a	200
HCFC		

Rev.A

8.7 Parameter Tables

8.7.1 Ver. 1.10

Add ress	Displayed characters	Initial value	Description
1	cAL	0	Control of mode DIP SW 1 and 2: ON (Interlock/error ON) 0: Normal mode, 1: IDLE countdown DIP SW 1 and 2: OFF (Interlock/error cancel) 0: No INTLK and Err display, 1: IDLE countdown/INTLK and Err display, 2: SUB-Interlock/error cancel
2	onbEEP	0	Laser emission sound control 0: No emission sound, 1: With emission sound
3	idLcool	300	Cooling device idling WAIT error (BA03 RY3 timer relay overtime) (sec)
4	dn cnt	10	Countdown timer
5	ctr ttL	0	Total counter shutdown 0: Count, 1: Stop
6	oFF Ai	3	Aiming beam auto off (min) 0: No auto off
7	oFF rdy	3	READY auto off (min) 0: No auto off
8	rSt ctr	0	Counter memory 0: Memory, 1: Clear
9	rSt LAS	2	Color/power/time memory 0: Memory, 1: Clear, 2: Memory (AIM_OFF)
10	uP Foot	0	POWER Foot SW Unavailable: 0, Available: 1
11	tSPot	10	Spot size detection wait time during coagulation × 10 (msec)
12	SnSSPot	2	Spot size detection sensitivity (bit)
13	Att oFF	400	AIM monitor In 5.1 threshold 400 = 2 V 1 V or less for TP20
14	oFF ALD	0	LD aiming/protective filter (PF) control (BIO/MO: LD-AIM) 0: PF operation in repeat mode (normal mode) with homochromatic aiming: factory-setting 1: PF operation in single mode with homochromatic aiming, switch to LD-AIM in repeat mode, PF-IN fixation in repeat COAG. 2: PF operation in single mode with homochromatic aiming, switch to LD-AIM in repeat COAG, PF-IN fixation in repeat COAG. 3: LD-AIM, PF-IN fixation in repeat COAG 4: LD-AIM, PF operation in repeat mode 5: Homochromatic AIM + LD-AIM simultaneous ON for coaxial adjustment
15	EP2 PFt	0	EG type of EPS 0: one circuit, 1: two circuits
16	2dL	70	Wait time after READY × 10 (msec): Coagulation is impossible during this time.
17	AdJA Ld	18	LD aiming software gain
18	tEP Ldd	180	LD power supply overheating wait time (sec)
19	oFSA Ld	14	Aiming software offset
20	GP1 oFS	100	Ch1 GRN offset (common among various deliveries)
21	GP2 oFS	100	Ch2 GRN offset (common among various delivers except the SL)
22	GP1 SL	100	GRN ch1 SL (integral type of ZEISS/NIDEK/HAAG) power correction factor
23	GP Lio	100	GRN monocular indirect ophthalmoscope delivery unit POWER gain spare
24	GP1Endo	100	GRN ch1 endophotocoagulation delivery unit POWER gain
25	GP2Endo	100	GRN ch2 endophotocoagulation delivery unit POWER gain
26	GP1 bio	125	GRN ch1 binocular indirect ophthalmoscope delivery unit POWER gain
27	GP2 bio	127	GRN ch2 binocular indirect ophthalmoscope delivery unit POWER gain
28	GP1HAAG	100	GRN ch1 HAAG attachable delivery unit POWER gain spare
29	GP1 yccb	100	GRN ch1 combination delivery unit POWER gain spare
30	yP1 oFS	100	Ch1 YEL offset (common among various deliveries)
31	yP2 oFS	100	Ch2 YEL offset (common among various deliveries except the SL)
32	yP1 SL	100	YEL ch1 SL (ZEISS/NIDEK/HAAG) POWER gain
33	yP Lio	100	YEL monocular indirect ophthalmoscope delivery unit POWER gain spare
34	yP1Endo	100	YEL ch1 endophotocoagulation delivery unit POWER gain
35	yP2Endo	100	YEL ch2 endophotocoagulation delivery unit POWER gain
36	yP1 bio	126	YEL ch1 binocular indirect ophthalmoscope delivery unit POWER gain
37	yP2 bio	127	YEL ch2 binocular indirect ophthalmoscope delivery unit POWER gain
38	yP1HAAG	100	YEL ch1 HAAG attachable delivery unit POWER gain spare
39	yP1ycb	100	YEL ch1 combination delivery unit POWER gain spare
40	rP1 oFS	100	Ch1 RED offset (common among various deliveries)
41	rP2 oFS	100	Ch2 RED offset (common among various deliveries except the SL)
42	rP1 SL	100	RED ch1 SL (ZEISS/NIDEK/HAAG) POWER gain
43	rP Lio	100	RED monocular indirect ophthalmoscope delivery unit POWER gain spare

Add ress	Displayed characters	Initial value	Description
44	rP1Endo	100	RED ch1 endophotocoagulation delivery unit POWER gain
45	rP2Endo	100	RED ch2 endophotocoagulation delivery unit POWER gain
46	rP1 bio	135	RED ch1 binocular indirect ophthalmoscope POWER gain
47	rP2 bio	137	RED ch2 binocular indirect ophthalmoscope POWER gain
48	rP1HAAG	100	RED ch1 HAAG attachable delivery unit POWER gain spare
49	rP1 yccb	100	RED ch1 combination delivery unit POWER gain spare
50	cti in27	10	Intlk2.7 detection time during coagulation (10 = 10 msec) OVER when the time is 10 msec or more
51	cti Er15	20	Err15 detection time during coagulation (10 = 10 msec)
52	ticoAG	90	Coagulation time correction value (+ msec)
53	ti rEP	26	Repeat time correction time (+ msec) when the protective filter is not fixed
54	HG in27	22	With the setting of GRN 310 mW or more, follow the suggested action of INTLK2.7. (+25%)
55	HG Er15	22	With the setting of GRN 310 mW or more, follow the suggested action of Err15. (-25%)
56	Hyr in27	22	With the setting of YEL/RED 160 mW or more, follow the suggested action of INTLK2.7. (+25%)
57	Hyr Er15	22	With the setting of YEL/RED 160 mW or more, follow the suggested action of Err15. (-25%)
58	-G in27	22	With the setting of GRN from 100 mW to 300 mW, follow the suggested action of INTLK2.7. (+25%)
59	-G Er15	22	With the setting of GRN from 100 mW to 300 mW, follow the suggested action of Err15. (-25%)
60	-yr in27	22	With the setting of YEL/RED from 100 mW to 150 mW, follow the suggested action of INTLK2.7. (+25%)
61	-yr Er15	22	With the setting of YEL/RED from 100 mW to 150 mW, follow the suggested action of Err15. (-25%)
62	LG in27	45	With the setting of GRN 90 mW or less, follow the suggested action of INTLK2.7 (+50%).
63	LG Er15	45	With the setting of GRN 90 mW or less, follow the suggested action of Err15. (-50%)
64	Lyr in27	50	With the setting of YEL/RED 90 mW or less, follow the suggested action of INTLK2.7. (+50%)
65	Lyr Er15	50	With the setting of YEL/RED 90 mW or less, follow the suggested action of Err15. (-50%)
66	GP Hid	200	GRN coagulation output maximum setting 10 (mW)
67	yP Hid	70	YEL coagulation output maximum setting 10 (mW)
68	rP Hid	70	RED coagulation output maximum setting 10 (mW)
69	2nd cnt	1	Output correction by the 2 nd monitor 0: off (dot presentation on the counter), 1: on (factory-setting)
70	oP PF	100	Err2 detection wait time (protective filter: close) (msec)
71	oPSHut	30	Err1 detection wait time (coagulation shutter: open) (msec)
72	cLSHut	30	Err1 detection wait time (coagulation shutter: close) (msec)
73	tiPF	100	Err2 detection wait time (protective filter: open) (m sec)
74	rEPPF	40	Protective filter start timing in REPEAT mode (msec)
75	cHc Erti	100	Check start time of MAIN overpower after SUB_READY (10 msec)
76	FILt	300	Flow rate when a message encouraging filter replacement is displayed 300 = 3.00L/min
77	ti cH	100	DUAL CH changeover motor wait time (msec)
78	Ati in27	10	Intlk2.7 detection time when the aiming is on (10 = 100 msec) OVER when the time is 10 msec or more
79	Ati Er15	10	Err15 detection time when the aiming is on (10 = 100 msec)
80	AP1 SL	100	SL ch1 aiming output gain (common among various colors)
81	AP1Endo	100	ENDO ch1 aiming output gain
82	AP1 bio	100	BIO ch1 aiming output gain
83	AP1HAAG	100	HAAG ch1 attachable aiming output gain
84	AP1ycb	100	Combo ch1 aiming output gain
85	AP2Endo	100	ENDO ch2 aiming output gain
86	AP2 bio	100	BIO ch2 aiming output gain
87	oFSG2-H	500	GRN 310 mW or more 2 nd monitor overpower offset
88	oFSy2-H	500	YEL 150 mW or more 2 nd monitor overpower offset
89	oFSr2-H	500	RED 150 mW or more 2 nd monitor overpower offset

Add ress	Displayed characters	Initial value	Description
90	oFSG3-H	500	GRN 310 mW or more 3 rd monitor overpower offset
91	oFSy3-H	500	YEL 150 mW or more 3 rd monitor overpower offset
92	oFSr3-H	500	RED 150 mW or more 3 rd monitor overpower offset
93	LocHnG	300	Power monitor circuit changeover output (mW) (300: GRN = 300, RED/YEL = 150)
94	oFSG2-L	500	GRN 300 mW or less 2 nd monitor overpower offset
95	oFSy2-L	500	YEL 140 mW or less 2 nd monitor overpower offset
96	oFSr2-L	500	RED 140 mW or less 2 nd monitor overpower offset
97	oFSG3-L	500	GRN 300 mW or less 3 rd monitor overpower offset
98	oFSy3-L	500	YEL 140 mW or less 3 rd monitor overpower offset
99	oFSr3-L	500	RED 140 mW or less 3 rd monitor overpower offset
100	G 50u	100	GRN 50 um POWER correction factor
101	G 60u	100	GRN 60 um POWER correction factor
102	G 70u	100	GRN 70 um POWER correction factor
103	G 80u	100	GRN 80 um POWER correction factor
104	G 90u	100	GRN 90 um POWER correction factor
105	y 50u	100	YEL 50 um POWER correction factor
106	y 60u	100	YEL 60 um POWER correction factor
107	y 70u	100	YEL 70 um POWER correction factor
108	y 80u	100	YEL 80 um POWER correction factor
109	y 90u	100	YEL 90 um POWER correction factor
110	r 50u	100	RED 50 um POWER correction factor
111	r 60u	100	RED 60 um POWER correction factor
112	r 70u	100	RED 70 um POWER correction factor
113	r 80u	100	RED 80 um POWER correction factor
114	r 90u	100	RED 90 um POWER correction factor
115	Ai G50u	0	Aiming GRN 50 um POWER correction 10 = +10%
116	Ai y50u	0	Aiming YEL 50 um POWER correction
117	Ai r50u	0	Aiming RED 50 um POWER correction
118	ti2 rEP	25	Repeat time correction in protective filter fixation mode
119	GFi 50	100	GRN 50 mW correction
120	GFi 100	100	GRN 100 mW correction
121	GFi 200	100	GRN 200 mW correction
122	GFi 300	100	GRN 300 mW correction
123	GFi 400	100	GRN 400 mW correction
124	GFi 500	100	GRN 500 mW correction
125	GFi 600	100	GRN 600 mW correction
126	GFi 700	100	GRN 700 mW correction
127	GFi 800	100	GRN 800 mW correction
128	GFi 900	100	GRN 900 mW correction
129	GFi1000	100	GRN 1000 mW correction
130	GFi1100	100	GRN 1100 mW correction
131	GFi1200	100	GRN 1200 mW correction
132	GFi1300	100	GRN 1300 mW correction
133	GFi1400	100	GRN 1400 mW correction
134	GFi1500	100	GRN 1500 mW correction
135	GFi1600	100	GRN 1600 mW correction
136	GFi1700	100	GRN 1700 mW correction
137	GFi1800	100	GRN 1800 mW correction
138	GFi1900	100	GRN 1900 mW correction
139	GFi2000	100	GRN 2000 mW correction
140	yFi 50	100	YEL 50 mW correction
141	yFi 100	100	YEL 100 mW correction
142	yFi 200	100	YEL 200 mW correction
143	yFi 300	100	YEL 300 mW correction
144	yFi 400	100	YEL 400 mW correction
145	yFi 500	100	YEL 500 mW correction
146	yFi 600	100	YEL 600 mW correction
147	yFi 700	100	YEL 700 mW correction
148	AdjSPot	100	Spot size soft gain
149	oFSSPot	100	Spot size soft offset

Add ress	Displayed characters	Initial value	Description
150	rFi 50	100	RED 50 mW correction
151	rFi 100	100	RED 100 mW correction
152	rFi 200	100	RED 200 mW correction
153	rFi 300	100	RED 300 mW correction
154	rFi 400	100	RED 400 mW correction
155	rFi 500	100	RED 500 mW correction
156	rFi 600	100	RED 600 mW correction
157	rFi 700	100	RED 700 mW correction
158	n-A	100	Not used
159	n-A	100	Not used
160	GP Hi	310	GRN and high power mode: Fiber optic cable end output setting 310 = 3100 mW
161	yP Hi	108	YEL and high power mode: Fiber optic cable end output setting 108 = 1080 mW
162	rP Hi	108	RED and high power mode: Fiber optic cable end output setting 108 = 1080 mW
163	GP Lo	150	GRN and low power mode: Fiber optic cable end output setting 150 = 1500 mW
164	yP Lo	81	YEL and low power mode: Fiber optic cable end output setting 85 = 850 mW
165	rP Lo	81	RED and low power mode: Fiber optic cable end output setting 85 = 850 mW
166	GP Ai	150	GRN and AIM mode: Fiber optic cable end output setting 150 = 1500 mW
167	yP Ai	30	YEL and AIM mode: Fiber optic cable end output setting 30 = 300 mW
168	rP Ai	70	RED and AIM mode: Fiber optic cable end output setting 70 = 700 mW
169	Hi-Lo	50	Power mode Low power mode up to the laser output of 500 mW
170	Gc HiL	250	GRN current limit 250 = 25 A
171	yc HiL	300	YEL current limit
172	rc HiL	300	RED current limit
173	oFS n-G	250	M2 (output) GRN motor origin offset
174	oFS n-y	250	M2 (output) YEL motor origin offset
175	oFS n-r	250	M2 (output) RED motor origin offset
176	oFS n-3	250	M3 (AIM) motor origin offset
177	FLo cnt	176	Flowmeter count of the cooling device 176/sec = 3.2 L (3300/L/min)
178	AdJ n-2	0	Output motor origin adjustment 0: Normal, 1: 50%, 2: 0%, 3: 100%
179	Ch cur	250	Not used in Ver. 1.10 or later Limit current after the channel is switched (during 300 msec)
180	AGP Hi	7	GRN and HI power mode AIMMAX setting MAX: 7% of original intensity
181	AyP Hi	27	YEL and HI power mode AIMMAX setting MAX: 27% of original intensity
182	ArP Hi	46	RED and HI power mode AIMMAX setting MAX: 46% of original intensity
183	AGP Lo	14	GRN and Low power mode AIMMAX setting
184	AyP Lo	37	YEL and Low power mode AIMMAX setting
185	ArP Lo	61	RED and Low power mode AIMMAX setting
186	AGP Ai	14	GRN and AIM power mode AIMMAX setting
187	AyP Ai	100	YEL and AIM power mode AIMMAX setting Increase the value for Address 167 when the aiming setting is more than 100.
188	ArP Ai	100	RED and AIM power mode AIMMAX setting
189	AdJ n-3	0	AIM motor origin adjustment 0: Normal, 1: 50%, 2: 0%, 3: 100%
190	n-A	100	Not used
191	ti rAtE	2	MOD sampling interval 2: 2 msec
192	Li rAtE	500	MOD control limit 200 = $\pm 20.0\%$
193	cntrAtE	5	MOD control dead zone 5 = $\pm 0.5\%$
194	dnrAtE	100	MOD control reduction ratio 100%
195	n -2rAtE	90	Spare
196	LG n-2	500	Spare
197	Ly n -2	500	Spare
198	Lr n -2	500	Spare
199	n-A	100	Not used
200	chG ti	30	Warm-up special limit current time ($\times 10$ msec) after switching to GRN
201	chy ti	30	Warm-up special limit current time ($\times 10$ msec) after switching to YEL
202	chr ti	30	Warm-up special limit current time ($\times 10$ msec) after switching to RED
203	chG cur	190	Warm-up special limit current ($\div 10$ A) after switching to GRN
204	chy cur	210	Warm-up special limit current ($\div 10$ A) after switching to YEL
205	chr cur	210	Warm-up special limit current ($\div 10$ A) after switching to RED
206	ch upti	3	One increment time to increase the power from the AIM level for mirror switching ($\times 10$ msec)
207	n-A	100	Not used
208	n-A	100	Not used

Add ress	Displayed characters	Initial value	Description
209	n-A	100	Not used
210	ch1 cnt	100	Fixed to one channel, (no sensor detection) 1: 1 ch fixed, others: normal
211	n-A	100	Not used
212	n-A	100	Not used
213	n-A	100	Not used
214	upd EEPr	100	Setting the parameter value to 50 and pressing the reset switch allows the parameters whose address is 200 or later to be input.
215	n-A	100	Not used
216	SP c ti	10	Spare (optional)
217	SP r ti	100	Spare (optional)
218	SP cnt	100	Spare (optional)
219	inEEPr	0	EEPROM initial setting 99+RESET: Initial setting of Addresses 1 to 299

8.7.2 Difference between Ver. 1.10 and 1.00

Addresses with * mark are added in Ver. 1.10. Addresses 14 and 179 are changed.

Add ress	Displayed characters	Initial value	Description
14	oFF ALD	0	Ver. 1.00 LD aiming control 0: Normal mode (only BIO: LD-AIM) 1: LD AIM in COAG, 2: LD coaxial adjustment (both: ON) 3: LD power adjustment (only LD: ON)
			Ver. 1.10 LD aiming/protective filter (PF) control (BIO/MO: LD-AIM) 0: PF operation in repeat mode (normal mode) with homochromatic aiming: factory-setting 1: PF operation in single mode with homochromatic aiming, switch to LD-AIM in repeat mode, PF-IN fixation in repeat COAG. 2: PF operation in single mode with homochromatic aiming, switch to LD-AIM in repeat COAG, PF-IN fixation in repeat COAG. 3: LD-AIM, PF-IN fixation in repeat COAG 4: LD-AIM, PF operation in repeat mode 5: Homochromatic AIM + LD-AIM simultaneous ON for coaxial adjustment
*23	GP Lio	100	GRN monocular indirect ophthalmoscope delivery unit POWER gain *spare
*33	yP Lio	100	YEL monocular indirect ophthalmoscope delivery unit POWER gain *spare
*43	rP Lio	100	RED monocular indirect ophthalmoscope delivery unit POWER gain *spare
*118	ti2 rEP	25	Repeat time correction in protective filter fixation mode
*148	AdjSPot	100	Spot size soft gain
*149	oFSSPot	100	Spot size soft offset
179	Ch cur	250	Not used in Ver. 1.10 or later Limit current after the channel is switched (during 300 msec)
*200	chG ti	30	Warm-up special limit current time (× 10 msec) after switching to GRN
*201	chy ti	30	Warm-up special limit current time (× 10 msec) after switching to YEL
*202	chr ti	30	Warm-up special limit current time (× 10 msec) after switching to RED
*203	chG cur	190	Warm-up special limit current (÷10 A) after switching to GRN
*204	chy cur	210	Warm-up special limit current (÷10 A) after switching to YEL
*205	chr cur	210	Warm-up special limit current (÷10 A) after switching to RED
*206	ch upti	3	One increment time to increase the power from the AIM level for mirror switching (× 10 msec)
*207	n-A	100	Not used
*208	n-A	100	Not used
*209	n-A	100	Not used
*210	ch1 cnt	100	Fixed to one channel, (no sensor detection) 1: 1 ch fixed, others: normal
*211	n-A	100	Not used
*212	n-A	100	Not used
*213	n-A	100	Not used
*214	upd EEPr	100	Setting the parameter value to 50 and pressing the reset switch allows the parameters whose address is 200 or later to be input.
*215	n-A	100	Not used
*216	SP c ti	10	Spare (optional)
*217	SP r ti	100	Spare (optional)
*218	SP cnt	100	Spare (optional: not used normally): available when of restart in the value of 50
*219	inEEPr	0	EEPROM initial setting 99+RESET: Initial setting of Addresses 1 to 299

8.8 DIP SW Table

The DIP switches are in the cover on the rear side of the control box.

DIP SW	DIP SW OFF (Adjustment)	Additional description
1	Interlock cancel	Set Address 1 to display the interlock indication.
2	Error cancel	Set Address 1 to display the error indication.
3	Current control	Set the current with the power knob: 30 A at MAX POWER. Turn on or off the aiming beam to turn on or off the current. ex. GRN: 2000 = 30 A, RED/YEL: 700 = 30 A
4	Error/Intlk OFF for the output system	INTLK2.7/2.8, Err 10/15
5	Not wait until the cooling device stops idling	It is possible to start the MC-300 within three minutes after turning the master switch on.
6	Parameter mode	Press the INTERVAL switch to change the parameter setting. Press the RESET switch to cancel the change. Pressing the TIME switches while turning the POWER knob changes the display in 10 increments. TIME switches: To increment or decrement the parameter address. POWER knob: To increase or decrease the value.
7	Output compensation OFF	Output correction factor such as SL
8	Service indication	The indication is displayed by the RESET switch. To switch the indication, press the RESET switch while pressing the POWER knob.

8.9 Necessary Tools

- Phillips screwdriver set
- Flatblade screwdriver set
- Blower brush
- Wooden stick
- Hexagonal wrench
- Needle nose wrench
- Nipper
- Wire stripper
- Soldering iron
- Tweezers
- Precise screwdriver set
- Industrial driver
- Multimeter
- Thermal powermeter
- Lens cleaning paper
- Mixed solvent of alcohol
- Threadlocking adhesive
- Heat shrinkable tube
- Silicon bond